Eastern Archipelago

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EASTERN ARCHIPELAGO, PART I.

(EASTERN PART.)

1890.

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EASTERN ARCHIPELAGO, PART I.

(EASTERN PART.)

COMPRISING

THE PHILIPPINES, SULU SEA, SULU ARCHIPELAGO, N.E. COAST OF BORNEO,
CELEBES SEA, N.E. COAST OF CELEBES, MOLUCCA AND GILLOLO
PASSAGES, BANDA AND ARAFURA SEAS, N.W. AND WEST COASTS
OF NEW GUINEA, AND NORTH COAST OF AUSTRALIA.

COMPILED FROM VARIOUS SOURCES BY

CAPTAIN J. P. MACLEAR, R.N.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

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ADVERTISEMENT TO PART I.

The Sailing Directions for the Eastern Archipelago consist of two parts :—Part I comprises the Eastern part of the Archipelago, from the China sea to the north coast of Australia,—Part II now being completed describe the western part of the archipelago.

The general descriptions of places in the first chapter of this work are derived from information already published in the China sea Directory, Vol. II.; from the Descriptive Dictionary of the Indian seas by J. Crawfurd ; "Malay Archipelago" and "Australasia" by A. R. Wallace ; "Voyages through the Moluccan Archipelago and to New Guinea" by Lieut. D. H. Kolff, of the Dutch navy ; "Voyage of the *Samarang*" by Sir E. Belcher ; and from various documents in the possession of the Hydrographic Department of the Admiralty.

The prevailing winds and weather are mainly from "Navigation of the Indian Ocean, China and Australian seas" by Captain A. B. Becher, R.N.; the Admiralty Wind and Current charts ; and from the logs of vessels in the possession of the Meteorological Office. The Gales and Typhoons of the Philippines are from a pamphlet by Captain M. Villavicencio, of the Spanish navy, and from the Barometer Manual of the Meteorological Office.

The Currents are taken from Captain Becher's work above mentioned ; "Navigation of the Pacific ocean and China seas" by the U.S. Hydrographic Office ; the Admiralty Wind and Current charts ; and from information supplied by the Meteorological Office.

The Directions for passages are from Captain Becher's work and the Navigation of the Pacific ocean and China seas above mentioned; from Horsburg, Vol. II., and from Sailing Directions for Indian Archipelago and China by A. G. Findlay.

The Sailing Directions for the Philippines are taken mainly from the Spanish Derrotero del Archipiélago Filipino 1879, and its annual supplements, together with information from the Remark Books of officers of H.M. ships employed on the China station ; with additions for the ports of Iloilo and Sebu and Basilan strait from the surveys of Staff Commander Reed and the officers of *H.M.S. Rifleman*, 1866-1870, Captain Chimmo and the officers of the *Nassau*, 1871-1873, and the voyage of the Challenger, 1874-1875.

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The Geographical positions of the principal points of the Philippine islands had been well determined in 1852 by Captain D. Cláudio Montero, of the Spanish navy, by a system of triangulation extending from the Babuyan islands, north of Luzon, along the western coasts of the Philippines to the southern coast of Mindanao, the longitudes being referred to the meridian of the Cathedral at Manila. Much, however, of the coast line between the points remains to be filled in, especially of the islands of Panay, Negros, and Mindanao, and these coasts must be approached with caution.

In 1834 the Spanish Hydrographic Commission was instituted, and under its first chief, Captain Halcon, the coast of Luzon, between the latitudes 13° 15′ and 16° N. was surveyed. The work of the Commission, interrupted for some time by the necessity of action against the pirates of Sulu, was resumed by in 1850, when Captain D. Cláudio Montero surveyed the Kalamianes and connected his survey with that of Paláwan island by Captain Bate, R.N. The Commission has since completed the survey of the Sulu Archipelago in connection with the work of H.M.S. *Nassau* in 1871-1873.

In the earlier surveys, the Eastern coast of Luzon, from cape Ildefonso to San Bernardino strait, was traced by the expedition under Malaspina and Maqueda in 1792-1793, and later in 1830 the coast of Albai and Tobako was surveyed by Señor Vargas. This entire coast, as well as the strait of San Bernardino, sketched by Captain Vernacoi in 1804, can only be considered as laid down approximately. The coast of Sebu island, Tañon strait and the north coast of Mindanao, sketched by Señor Campo, were also among the earlier surveys, and can only be considered as approximately laid down.

The eastern coast of Samar, Leite, and Mindanao have been laid down from anonymous charts in which little reliance is to be placed; nor is the south coast of Mindanao, between Mindanao river and cape San Augustin, known with any certainty.

The Sailing directions for the Kalamianes and Cuyos islands have been taken from the Derrotero with the addition of the information already published in the China Sea Directory, Vol. II., from the surveys of Commander Bate and Captain Maclear, R.N.; and for the Sulu sea from the surveys of H.M.S. *Nassau*, 1871-1873; and for the Sulu archipelago from the above survey of the *Nassau*, with additions from the surveys of the Spanish Government, published in the Derrotero of 1879 and its annual supplements. Horsburgh's Directory, the Nautical and Mercantile Magazines, and the Remark Books of H.M. ships have also been consulted.

The Sailing Directions for Balábac strait and the channels between Paláwan and Borneo, and part of the north-east coast of Borneo, including Mallawallé channel, are from the surveys of Staff-Commander Reed and the officers of the *Rifleman*, 1868-1870 : for the north-east coast of Borneo and off lying islands and reefs and Sandakan harbour, from the surveys of H.M. ships *Samarang*, 1844-1849, *Nassau*, 1871-1872, *Flying Fish*, 1881, *Magpie*, 1883 and *Rambler*, 1889. The coast to the southward of Unsang peninsula, including Darvel bay and the Ligitan islands, has not yet been surveyed.

The Sailing Directions for the Moluccas have been compiled mainly from Horsburg's Directory and the "Molueksche Archipel," with additions from the voyage of the *Challenger*, the Remark Books of officers of H.M. ships *Serpent* and *Nassau*, and the surveys of H.M.S. *Flying Fish*, 1885 ; from Wallace's "Malay Archipelago" and the "cruise of the *Marchesa*," Findlay's Sailing Directions for the Indian Archipelago, the French "Instructions Nautiques sur le Grand Archipel d'Asie," and the Nautical and Mercantile Marine magazines have also been consulted.

The Sailing Directions for the Banda and Arafura seas have been compiled from Horsburgh's Directory, the "Moluksche Archipel' "Voyages through the Moluccan archipelago and to New Guinea" by Lieut. Kolff, of the Dutch navy, and from the surveys of H.M. ships *Challenger*, 1874, and *Flying Fish*, 1885.

The Sailing Directions for the North-west and west coasts of New Guinea are from Horsburgh's Directory, Findlay's "Indian Archipelago," 3rd Edition, Kolff's "Voyage through the Moluccan Archipelago and to New Guinea," the "Moluksche Archipel," the "Cruize of the *Marchesa*" and from the Hydrographic notices issued by the Admiralty.

No connected survey has been made of these coasts, our knowledge of them is derived from many isolated expeditions touching at various points, and the longitudes of the principal points are open to great doubt. The north coast of Waigiu island was surveyed by Captain Forrest in 1775, and by D'Urville in 1827 ; Dampier strait and the north coast of New Guinea was explored by Dampier in 1700, and McCluer in 1791, later additions to our knowledge have been made by Sir E. Belcher in 1840, Captain Moresby in 1875, and the U.S. sloop *Alert* in 1877. Battanta and Salwatti islands are known from the "cruize of the yacht *Marchesa*" in 1883. Selé strait was explored by Signor Cerruti in 1870, and the German frigate *Gazelle* in 1875. McCluer inlet was mapped by McCluer in 1791, Segaar and

Patippi bays by the officers of the German vessel of war *Gazelle* in 1875. Alexandra and Freshwater bays were examined by Signor Cerruti and Captain di Lenna in 1870. Kamrau bay was explored by the Dutch steamer *Etna* in 1857. The coast from Triton bay to Prince Frederick Henry island was explored by Lieut. Kolff in 1825, Lieut. Modera in 1828, Lieut. Kool in 1835, and by D'Urville in 1839. Besides the above, many scientific expeditions have been sent by the Dutch Government.*

The Sailing Directions for the North coast of Australia are from the survey by Captain Stokes, R.N., 1838-1842, already published in Australia Directory, Vol. II., and from the late surveys of Popham bay, cape Don, and Clarence strait by Captain Maclear, R.N., 1885, and of port Darwin by Commander Hoskyn, R.N., 1885.

Officers of the Royal and Mercantile Marine are requested to transmit to the Secretary of the Admiralty any notices of errors or omissions they may discover, as well as any fresh information they may obtain, in order that this work may be improved for the general benefit of the navigator.

By the publication of this volume all Hydrographic Notices relating to the area embraced by it, and all notices to Mariners, inclusive of No. 519 of 1890, are cancelled.

W. J. L. W.

Hydrographic Office, Admiralty, London.
November, 1890

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* A complete paper on the Progress of Discovery on the coasts of New Guinea, with Bibliographical index, was published in 1884 by the Royal Geographical Society. *See* Supplementary papers, Vol. I., part 2.

SYSTEM OF ORTHOGRAPHY.

As far as has been found possible with existing knowledge the native names in this book are spelt in accordance with the following system, which will be gradually introduced into all Admiralty Sailing Directions :—

1. Where native names have been so long written in a form, which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained, and no European names are changed from the correct orthography.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation of the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English, *every letter being pronounced.* One accent only is used, the acute, to denote the syllable on which stress is laid. This is very important, as the sounds of many names are entirely altered by the misplacement of this "stress."

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai*, *au*, *ei*.

The amplification of the rules is given below.

Information as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system, is invited.

Letters.	Pronunciation and Remarks.	Examples.
a	*ah*, *a* as in *father* - - - -	Java, Banāna, Somáli, Bari.
e	*eh*, *e* as in *benefit ; a* as in *fate* - -	Tel-el-Kebír, Oleléh, Yezo, Levúka, Peru.
i	English *e ; i* as in *ravine ;* the sound of *ee* in *beet.* Thus, not *Feejee*, but	Fiji, Hindi.
o	*o* as in *mote* - - - - -	Tokio.

Letters.	Pronunciation and Remarks.	Examples.
u	long *u* as in *flute*; the sound of *oo* in *boot*. *oo* or *ou* should never be employed for this sound. Thus, not *Zooloo* or *Zoulou*, but	Zulu, Sumatra.
	All vowels are shortened in sound by doubling the following consonant.	Yarra, Tanna, Mecca, Jidda, Bonny.*
	Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa.
ai	English *i* as in *ice* - - - -	Shanghai.
au	*ow* as in *how*. Thus, not *Foochow*, but	Fuchau.
ao	is slightly different from *au* - -	Macao.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from *ey* in the English *they*.	Beirút, Beilul.
b	English *b*.	
c	is always soft, but is so nearly the sound of *s* that it should be seldom used. If *Celébes* were not already recognised, it would be written *Selébes*.	Celébes.
ch	is always soft, as in *church* - - -	Chingchin.
d	English *d*.	
f	English *f*. *Ph* should not be used for the sound of *f*. Thus, not *Haiphong*, but	Haifong, Nafa.
g	is always hard. (Soft *g* is given by *j*) -	Galápagos.
h	is always pronounced when used.	
j	English *j*. *Dj* should never be put for this sound.	Japan, Jinchuen.
k	English *k*. It should always be put for the hard *c*. Thus, not *Corea*, but	Korea.
kh	The Oriental guttural - - -	Khan.
gh	is another guttural, as in the Turkish -	Dagh, Ghazi.
l m n	As in English.	
ng	has two separate sounds, the one hard as in the English word *finger*, the other as in *singer*. As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	
p	As in English.	
ph	As in *loophole* - - - - -	Mokpho, Chemulpho.
th	Stands both for its sound in *thing*, and as in *this*. The former is most common -	Bethlehem.

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* The *y* is retained as a terminal in this word under the rule in paragraph 1. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
q	should never be employed; the sound of *qu* in *quiver* is given as *kw*. When *qu* has the sound of *k*, as in *quoit*, it should be given by *k*.	Kwangtung.
r	As in English.	
s	As in *sin*.	
sh	As in English.	
t		
v		
w	- - - - - -	Sawákin.
x		
y	is always a consonant, as in *yard*, and therefore should never be used as a terminal, *i* or *e* being substituted	Kikyu.
	Thus, not *Mikindány*, but	Mikindáni.
	nor *Kwaly*, but	Kwale.
z	English *z* - - - - -	Zulu.
zh	French *j*, or as *s* in *treasure* - -	Muzhdaha.
	Accents should not generally be used, but where there is a very decided emphatic syllable or stress which affects the sound of the word, it should be marked by an *acute* accent - - - -	Tongatábu, Galápagos, Paláwan, Saráwak.

GLOSSARY OF A FEW USEFUL GEOGRAPHICAL AND SEA TERMS IN THE MALAY AND TAGALA LANGUAGES.

English.	*Malay.*	*Tagala.*
Anchor	Sawuh	Sao.
Anchorage	Labuan	
Banana	Pisang	Saguing.
Bay	Teluk	Luk.
Bird	Burung Manuk (Jav.)	Ibon.
Black	Itam	Maitim.
Calm	Tedoh	Kalinauan.
Cane (bamboo)	Buluh, Bambu	Kauayan.
—— (rattan)	Rotan	
—— (sugar)	Tebu	Tubu.
Cape, point	Tanjong Ujong (Jav.)	Ongot.
Channel	Trusan	
Coal	Arang	
Coast (seaboard)	Pantei, Tepilaut	Baibai.
—— (dryland)	Darat	
Coco-nut	Kalapa	Niyog.
Compass (Mariners')	Padoman	
North	Utara	Hilaga.
East	Timur	Silangan.
South	Salatan	Habagat.
West	Barat	Kalonoran.
Coral	Karang	
Current	Arus	Agos.
Deep	Dalam	Malalim.
Dry	Kring	Tuyo.
Fire	Api	Apui.
Fish	Ikan	Isda.
Fruit	Buwah	Bunga.
House	Rumah	Balai

English.	*Malay.*	*Tagala.*
Iron	Besi	Bakal.
Island	Pulo Nusa (Jav.)	Polo.
Land	Tanah	Lupa.
Large, great	Besar	Malaki.
Little, small	Kechil	Munti.
Long	Panjang	Mahaba.
Low	Rendah	Mababa.
Mole, jetty	Jembatan	Pantalan.
Mountain	Gunong	Bondog.
Mouth, of a river	Kawala	Ilogan.
Mud	Lumpar	Losak.
Rice, in the straw	Padi	Palai.
River	Sungi	Ilog.
Road	Jalar	Daan.
Rock, stone	Batu	Bato.
Sail	Layar	Layag.
Salt	Masin	Asin.
Sand	Pasir	Bohangin.
Sea	Laut	Dagat.
Shallow	Tohor	Mababao.
Shoal, sand	Beting	Takut.
Ship	Kapal Prau	Darung. Balangai.
Strait	Selat	Kitir.
Tide, flood	Pasang naik	Dagat Laki.
——, ebb	———— turun ———— surut	—— hibas.
——, high	———— besar	
——, low	———— kring	—— tagas.
Tree	Pohun Kayu	Kahui.
Town	Negri	Bayan.
Water	Ayer	Tubig.
Wind	Angin	Hangin,

GLOSSARY OF NATIVE WORDS FREQUENTLY OCCURRING IN THE CHARTS AND SAILING DIRECTIONS.

Abacá (Tagala)	Manila hemp.
Alimpaya (Bisayan)	Tide race, eddies.
Balate (Tag. and Bis.)	The Indian fig.
Balete (Tag. and Bis.)	Bêche de Mer.
Bantiki (Tag. and Bis.)	A tree resembling olive.
Carey or Karei (Tag. and Bis.)	Turtle shell.
Dako (Bisayan)	Great.
Ef (Misol)	Island.
Gusong (Malay)	A reef of rocks.
Kapis (Tagala)	Pearl shell.
Kasiran (Moro)	Native paddy.
Kauit (Tag. and Bis.)	A creek, a bend, a hook; frequently employed to name a point.
Kelong (Tagala)	A large oyster.
Kilong (Tagala)	Fish stakes.
Kima (Tagala)	A large clam.
Kogon (Tag. and Bis.)	A reed used for roofing houses—the *Allang Allang* of the Moluccas.
Kogonal	A thicket or plantation of Kogon.
Kolasi (Bisayan)	A resinous tree.
Kota	A fort.
Masila (Moro)	Great.
Mis or Mios (New Guinea)	Island.
Parido (Moro)	Small.
Salanganes	Edible birds nests.
Si (Malay)	A particle inseparably united to nouns, and denoting familiarity.
Sibukao (Tagala)	Sappan wood.
Sugur (Moro)	A bay.
Talisai (Tag. and Bis.)	A useful tree—*Terminalia Catappa.*
Trumbu (Malay)	A dangerous hidden shoal.
Wai (Buru)	A river.

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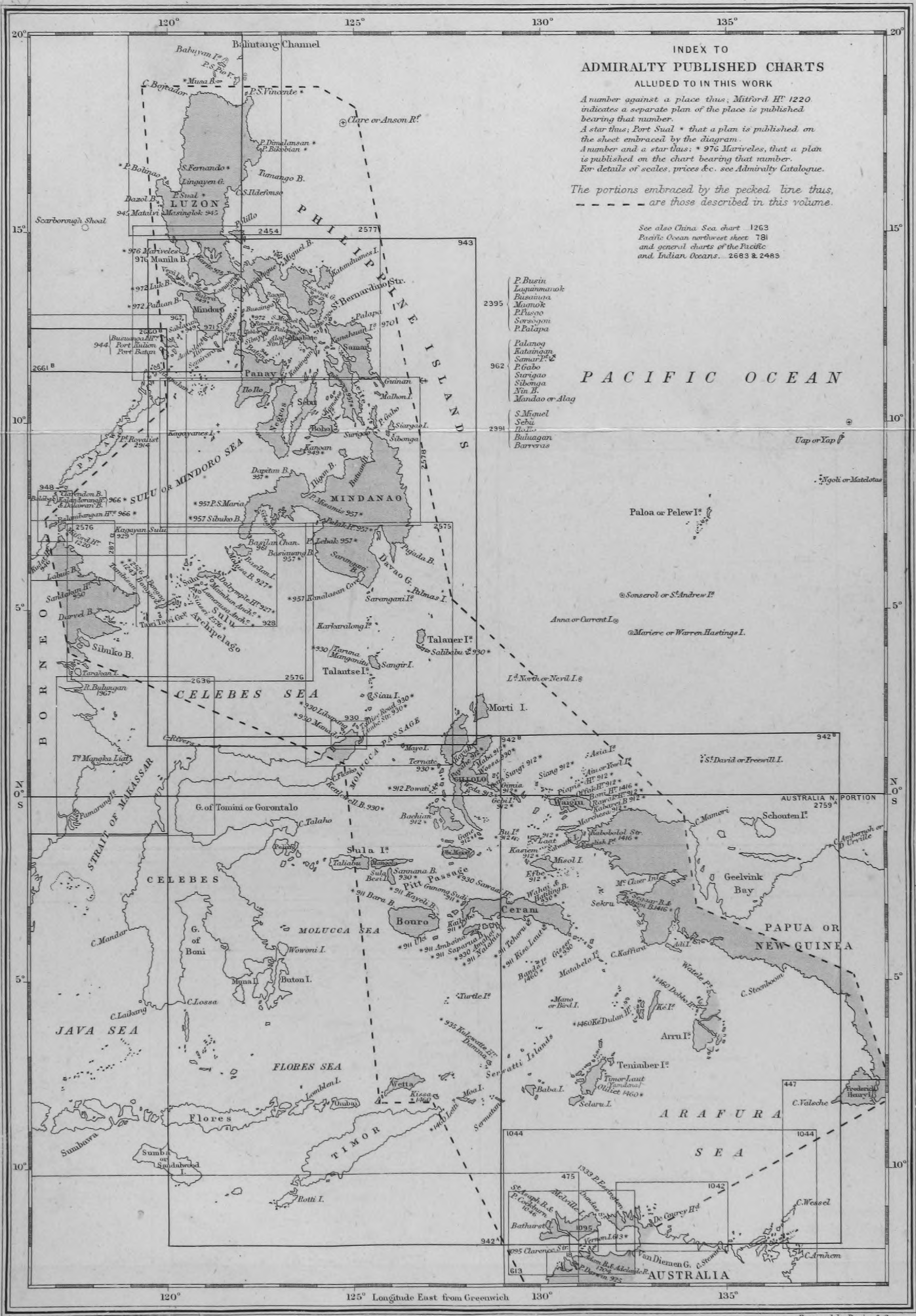
IN THIS WORK THE BEARINGS ARE ALL MAGNETIC EXCEPT WHERE MARKED AS TRUE.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF 60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO 100 FATHOMS.



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2395	P. Busin Laguinmanok Busainga Maamok P. Pasao Sorsogon P. Palapa
962	Palanog Katainganr Samar Pt. P. Gabo Surigao Sibonga Nin B. Mandao or Alag
2391	S. Miguel Sebu Ilo Ilo Buluagan Barreras

A.G. Eastern Archipelago - Part I.

December 1890

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INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

ON THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

There are three descriptions of publications as guides to navigation—the charts, the sailing directions, and the light lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted. The sailing directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the charts must be taken as the guide.*

Charts.—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the depôts as are required, and are so issued to the ships.

All small but important corrections that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections that cannot be conveniently thus made are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart, in order that at the Admiralty it may be known what edition of the chart is referred to.

The Light Lists, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer when he receives the set of charts to make notations in the light lists from these appendices, and from the Notices to Mariners in the box; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions may be obsolete, in consequence of changes made since publication.

The Sailing Directions are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplement or Hydrographic Notices is to be noted, in the tabulated form now being placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices as are of moderate size are now being printed on one side only, and two copies are issued to each ship; one to cut up, the slips being pasted in at the appropriate place; the other to retain intact for reference.

To make these notations or paste in these slips is one of the early duties of a navigating officer after drawing his box of charts and books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide ; for which purpose, for ordinary navigation, they are sufficient.

THE USE OF CHARTS AS NAVIGATIONAL AIDS.

Accuracy of a Chart.—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep ; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch.

Fathom Lines a Caution.—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the time required for such a detailed examination does not permit of its execution, nor do the necessities of the case demand it.

The ten-fathom line is, on rocky shores, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Distortion of Printed Charts.—The paper on which charts are printed has to be damped. On drying distortion takes place, from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

Chart on largest scale always to be used.—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or soundings. This is an additional reason, besides the obvious one of the greater detail shown on a larger scale chart, why this largest scale chart should always be used for navigating.

Caution in using small Scale Charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

Lights.—All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table in the Light List affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the origin of a sound, even in clear weather. Therefore too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

Tides and Tidal Streams.—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 98 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs in temperate regions at the equinoxes, but wind may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

Fixing Position.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen ; and second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station pointer, which is in every chart box.

The latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up ; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed.

In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

The tripod now supplied to all ships to hold the lamp over the standard compass will be found of great service in fixing position at night, as by its aid a bearing can be as accurately taken as in daylight. Its use in connection with ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line. A deep cast at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon. The Sumner lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

Current Arrows on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

Change of Variation of the Compass.—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change, may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles. The variation chart should be consulted on this head, *Use of Oil for Modifying the Effect of Breaking Waves.*—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and its application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follow :—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain; as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be: hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

For later information respecting the lights which are described in this Work, seamen should consult the Admiralty list of lights in South Africa, East Indies, China, &c. This light List is published early in the current year, corrected to the preceding 31st December

EASTERN ARCHIPELAGO.—PART I.

(EASTERN PART.)

CHAPTER I.

GEOGRAPHY; WINDS AND WEATHER; CURRENTS AND TIDES; COMMUNICATIONS; PASSAGES.

GENERAL REMARKS.—This work contains a description of the Eastern portion of the Eastern archipelago, namely, the islands that border the steam route usually followed from China to Australia. It works from North to South, from the China sea through the Sulu and Celebes seas, Molucca passage, Banda and Arafura seas; and includes a description of the Philippine islands, the Sulu archipelago, the N.E. extremities of Borneo and Celebes, Gillolo, Ceram and Buru islands, the Arafura sea, and the western coast of New Guinea.

The northern limit of the work commences with the north part of Luzon island, where it overlaps the China Sea Directory, Vol. II., repeating the description given in that work of the west coasts of Luzon and Mindoro, and of Mindoro strait; from whence it continues south, with the description of the Sulu sea and Basilan strait.

The Sulu archipelago and the N.E. extremity of Borneo are next treated, and then the inner routes among the Philippines, the straits of San Bernardino and Surigao, leading to the Pacific, and the eastern shores of the Philippines. The work then continues to the southward, including the south coast of Mindanao, the Celebes sea, the N.E. extremity of Celebes island, the Molucca passage and Manipa strait, with the islands on each side, the Banda sea, the western coast of New Guinea, and, lastly, the Arafura sea.

The southern limit of the work embraces, along with the Arafura sea, a description of port Darwin and the approaches to it, viz., the part of the North Australian coast included between De Courcy head to the east, and Adam bay to the west. In this it overlaps the Australia Directory, Vol. III., which contains the furthur description of the coast of North Australia. For information about Torres straits, the navigator is referred to Australia Directory, Vol. II.

Want of Surveys.—The greater part of the coasts and waters herein described are as yet very imperfectly surveyed. Even in the larger scale charts, founded on more recent surveys, omissions must be expected, as the irregular character of the depths, and the prevalence of coral formations forbid any certainty that all dangers have been discovered. The older surveys are, in most cases, mere preliminary sketches.

GEOGRAPHY.—Philippine islands.—The northern apex of the East Indian archipelago is formed by the group of Philippine islands discovered by the Spaniards in the year 1519. In this archipelago the illustrious circumnavigator, Magellan, lost his life in a skirmish in the year 1621. Luzon in the north, and Mindanao in the south, are the two largest islands of the group; between these there are several smaller islands, the most important of which are Mindoro, Paláwan, Panay, Negros, Sebu, Leiti, and Samar. The islands generally are mountainous, and have many volcanic cones; that of Albai, in the southern part of Luzon, is 8,500 feet high, and constantly emits smoke and steam. Most of the islands are clothed with forests of ebony, iron wood, cedar and sappan wood. The chief products are indigo, rice, sugar, tobacco, hemp, cacao, and coffee.

Three seasons are recognised in the Philippine islands; the cool and dry season begins in November, and lasts during the north-east monsoon; the *secar*, or period of heat and drought, begins in March and continues till May, when the heat is almost unbearable; and the rainy season comes in with the south-west monsoon, lasting till September or October.

The people of the islands, besides the comparatively few Spaniards and Chinese settlers, consist of the aboriginal Abetas or Etas, of dark brown colour, with woolly hair and regular features, living in independent tribes in the interior; and those of Malay origin, known as Tagalas and Bisayas, occupying the maritime districts.

Manila, the capital of Luzon, and the seat of the Spanish Government in the East, was founded by Legaspi in 1571. The southern part of the city, surrounded by a wall, and containing the Government offices, citadel, and hospitals, is separated from the northern and commercial quarter by the river Pasig. Its chief dependence was formerly on the trade of Acapulco, carried on in a few vessels, which usually sailed in March or April from that place, and arrived in Manila in August or September.

The population of Manila was estimated in 1885 at 243,886, and a considerable trade is now carried on with Hong Kong, Singapore, and Europe, chiefly in sugar, tobacco, and hemp. The ports open to foreign traffic are those of Manila, Iloilo, Sebu, Legaspi or Albai, and Samboanga. Local traffic between the other ports is carried on in steamers and schooners. There is steam communication with Hong Kong about three times a week, with Singapore once a week, and directly with Spain once a month.

The Sulu archipelago is a chain of islands, more than 150 in number, extending between the south-west extremity of Mindanao and the north-east extremity of Borneo. It is divided into three groups, taking their names from the principal islands in each: that of Basilan to the eastward, Sulu in the centre, and Tawi Tawi near the coast of Borneo.

The sovereignty of Spain has been recognised over all the Sulu islands and Kagayan Sulu, but these countries are really in the hands of native Malay or Arab chiefs, and the influence of the Spaniards is confined to the coast ports. The Sultan of Sulu, who formerly claimed dominion over most of the islands and over Western Borneo has no power beyond the immediate vicinity of the town of Sulu.

The inhabitants are all Mahometans, of Malay race, speaking a peculiar language, which they write in the Arabic character. They are considerably advanced in civilization, cultivating rice, and rearing the buffalo, ox, horse, goat and poultry. The pirates of the archipelago were once a terrible scourge to the eastern seas, but the constant efforts of the Spaniards and Dutch, and of Sir James Brooke, have extirpated most of them, and the prevalence of steamers has led them to use smaller boats; but they are still a terror to native vessels and to many unprotected coasts.

The principal articles of commerce furnished by the islands are, tortoise shell, tripang, and edible birds' nests, besides pearl and pearl-shell. A steamer from Manila makes the round of the islands twice a month, and there is occasional steam communication between Sulu and Borneo.

Borneo, the largest island in the East Indian Archipelago, is about 690 miles long north and south, and 600 miles across the broadest part. Chains of mountains traverse its length; the main range, 5,000 to 6,000 feet high, terminates in mount Kina-Balu (13,700 feet high), about 50 miles from the north extreme of the island; from this range several ridges extend in an easterly and south-easterly direction, some of which are connected by cross ridges; these, as a rule, rise abruptly from the plains, and are steep and narrow.

In addition to the main range, which lies about 25 miles inland, and between it and the sea on the west, there is another range 3,000 to 4,000 feet high, known as the coast range, lying parallel with the shore. Magnificent forests of iron wood, teak, and the gutta-percha tree, with many others, besides palms and canes, cover the land; these forests abound with elephants, rhinoceros, buffaloes, bears, wild swine, deer, and orangutan.

The greater part of the island is nominally under the Netherlands Government, the independent native kingdoms of Sarawak and Bruni and the territory of Saba being confined to the north and north-western districts. Sarawak is of interest as having been governed by Sir James Brooke (Rajah Brooke) for a great number of years, who did much to civilise the country, and to abolish piracy in the neighbouring seas.

The territory of British North Borneo includes the northern portion of the island, and has an area of about 31,000 square miles. It was ceded by the Sultans of Bruni and Sulu in the years 1877-8, and confirmed by Royal Charter, 1st November, 1881.

The chief products of British North Borneo are tobacco, sugar, pepper, coco-nuts, betel or arica nut palm, sago, tapioca, ginger, india-rubber, gutta-percha, and camphor.

Elopura, in the fine harbour of Sandakan, on the north-east coast, is the chief place of trade.

The population of Borneo, estimated at nearly two millons, are for the most, Dyaks, a taller and more muscular people than the Malays, though evidently of the same race. The Dyak and Dusun tribes are the aborigines inhabiting the interior of the island, and are in subjugation to the Malays, who reside on the coast; there are also a large number of Chinese colonists.

In the territory of British North Borneo the estimated population is only 150,000, consisting of Mahomedan Malays with an infusion of Chinese and Arab blood, on the coast, and the aborigines, chiefly Dusuns, in the interior.

Borneo appears to be rich in minerals. In the state of Landak the great diamond of the Rajah of Mantan was found; the territory of Montrado, north of Landak, has several gold mines. In British North Borneo, gold, copper, tin, and coals have been found; in province Dent a seam of coal rises to the surface, and is said to be of excellent quality.

Tulauer and Sangir groups are two groups of islands between Mindanao and Celebes. The Sangir group is entirely volcanic, and seems to be a continuation of the volcanic belt of North Celebes. Both groups are governed by their own Rajahs, under the Residency of Manado, and carry on a trade in coco-nuts and oil with Manado and Ternate.

Celebes island is the third in magnitude of the Malay archipelago. Its physical aspect, as regards its form, is most remarkable, consisting as it does of an irregular central body, whence radiate four long and narrow arms, separated by deep, spacious gulfs, which give it a fantastic appearance on the map very unlike that of any other island, except the neighbouring smaller island of Gillolo, which strangely resembles it in figure. The northern peninsula, which is the only part of the island treated in this work, is a long, narrow, and curved strip of land extending over 6° of longitude, reckoning from the bay of Palos to its extremity, in some places not exceeding 10 miles in breadth, and nowhere exceeding 40. A range of mountains runs through it, the general height of which does not exceed 2,000 feet, while some peaks rise to 4,000, 5,000, and even 6,000 feet. The whole of this peninsula is rugged and mountainous. The town of Manado, the capital of the Minahassa district, and the seat of the Resident is situated at the head of a spacious bay on the north coast. The anchorage is bad and only available during the south-east monsoon. The Minahassa district is very fertile, and produces coffee, nutmegs, vanilla, mace, coco-nuts, and every variety of fruit.

Moluccas.—The term Moluccas, though originally applied to the five small islands of Ternate, Tidor, Motir, Makian, and Bachian, which lie off the western coast of the large island of Halmaheira, or Gillolo, now includes all the islands which are comprised between Celebes on the west, Timor on the south, and New Guinea on the east. The Moluccas may be divided into three groups, the *Northern* consisting of Halmaheira, with a number of islands closely adjoining it, and extending as far south as the Obi islands; the *Central group*, which is separated from the former by the Ceram sea, and comprises the large islands of Ceram and Buru, together with Amboina and many smaller ones off the south-west coast of Ceram; and finally, the *Southern group*, which includes Banda, and the chain of islands lying between it and the Timor sea, and which may be said to form a continuous belt extending from Timor to the Arru islands, and from these latter to the south-east coast of Ceram.

The government of the northern group is administered by the Resident of Ternate; of the central group by the Resident of Amboina; and the remainder by the Assistant-Resident of Banda.

The islands are generally rugged and mountainous. Gillolo and Ternate have active volcanoes; that of Ternate has been in constant state of activity for more than 200 years, during which period there have been no less than 14 eruptions, the last of which occurred in 1840, and was attended by great loss of property.

The trade consists of coffee, coco-nuts, tobacco, and dammar. The steamers of the *Netherlands India Company* touch at these islands once a month. Obi is uninhabited and but little known.

Ceram, or Central group.—The principal islands are Ceram, Buru, and Amboina. Ceram—this is the Portuguese orthography for the Serang of the Malays—is the largest of the Moluccas, though very far from being of value proportionate to its extent. A chain of mountains runs through it from east to west, or rather, the island is itself little more than one mountain range, some of its peaks rising to the height of 6,000 and 8,000 feet above the sea, and the highest, Nusa Keli, to as much as 9,250 feet. The entire island is covered with a dense, unbroken forest; but, though many of the trees are of stupendous growth, none—so far as is known—are adapted for ship-building. The eastern coast is bold and precipitous, and difficult of access; and, although both on the northern and the southern coasts there are several deep and spacious bays, there is no really good harbour on either coast. There is no steam communication with Ceram.

Buru.—With the exception of the broad bay of Kayeli, Buru is a compact unbroken mass of land of an oval form, apparently of sedimentary formation. The interior is a congeries of hill and mountain, divided by narrow valleys or deep ravines. The coast is alluvial and marshy. The soil is comparatively poor and sterile and beyond cajuput oil there are no natural or vegetable products. Kayeli bay affords excellent and well-sheltered anchorage in both monsoons, and is much frequented by coasting traders from Makassar and Singapore. There is a large export trade in fish and cajuput oil.

Amboina is the largest of a group of five islands lying about 10 miles distant from the south-west coast of Ceram, which have been long celebrated for their clove plantations, first introduced in 1651, and the cultivation of which spice was, until a comparatively recent period, restricted to these islands.

Amboina contains but one volcano, which, though, for several centuries in a state of eruption, has been quiescent since 1824. The principal rocks are granite and serpentine, with much coralline limestone. The whole island is hilly, but none of the mountains rise to any considerable elevation; some of the heights are rounded and clothed with verdure, while others are bare-topped and only partially wooded. The valleys are rich, being filled with decomposed volcanic ashes, but a large part of the island is arid and rocky, and unsuited for general agriculture. The clove has been gradually going out of cultivation, the soil and climate, though apparently similar to that of its native home (Ternate and Tidore), being unfavourable. The pepper plant and cinnamon grow wild, and amongst articles of cultivation are coffee, cotton, and indigo; there is an abundance and great variety of fruits, amongst which may be noticed the true or seedless bread-fruit tree, which is not found in any other island of the archipelago.

Amboina is the chief port of trade for the whole of the central and southern islands of the Moluccas. In 1886, the value of exports (exclusive of Government) was £39,984, that of the imports £89,885. The principal articles exported are cloves, nutmegs, mace, and rattan, with birds of paradise, tortoise and other shells, and beeswax in smaller quantities.

Vessels of the *Netherlands India Steamship Company* call at Amboina about twice a month.

Banda group.—In this group are the Banda isles, the Goram and Matabela groups, the Ké and Arru islands, and the Serwatti islands.

Banda isles consist of ten small islands all closely adjoining, and situated about 60 miles from the south-east point of Ceram, and about 120 miles to the south-east of Amboina. The largest island is Banda Lontar, on which are most of the nutmeg plantations; next to it in point of size is Banda Neira, which contains the principal Dutch settlement. Gunong Api, which fronts Lontar, is an active volcano.

The Banda Islands are of volcanic formation, Gunong Api being only the centre of what was once an enormous crater, of which Lontar, Neira, and the connecting islets form the rim, whilst those lying at a greater distance were gradually raised by the frequent discharges of volcanic matter. With the exception of the bare and ever smoking cone of Gunong Api, which rises to a height of 2,500 feet, the islands are of moderate elevation, the hills, which seldom exceed 1,000 feet, being clothed with a rich and luxuriant verdure. Almost the entire surface is planted with nutmeg, which is grown under the shade of lofty kanari trees, and which requires no manure and but little attention, so favourable are the conditions of the soil and the climate. The Government monopoly was abandoned in 1864, and the plantations are now chiefly in the hands of a few large proprietors. Cloves and a variety of fruits are amongst the natural products, whilst of recent years coffee has been introduced with success into some of the islands. The whole group is subject to frequent earth-quakes, and has more than once been almost overwhelmed by the eruptions of Gunong Api, which has now been quiescent since 1852.

In addition to nutmegs, there is a considerable trade in oil—extracted from the nuts of the kanari tree—birds of paradise skins, pearl, and tortoise-shells, and other products of eastern islands. In 1885 the total number of nutmeg estates was 34, the number of workmen employed on them was 2,869, and the yield was 843 tons of nutmegs, and 150 tons of mace, of the value of about £90,000.

The harbour, which is formed by the three islands of Lontar, Neira, and Gunong Api, is secure and safe at all seasons, being almost completely land-locked. The eastern entrance is best.

The Banda group is under the administration of an assistant resident, who has also control over the east portion of Ceram, and the remaining islands of the Moluccas.

The vessels of the *Netherlands India Steamship Company* touch once a month.

Ceram Laut islands, a cluster of small islets which lie about 6 miles off the south-east end of Ceram. The most important are Gisser, and Kiluaru, which are separated by a narrow channel affording good anchorage in both monsoons. Kiluaru islet is only a few feet above the level of the sea, but has nevertheless a large Bugis and Ceram population, and is greatly resorted to by traders from New Guinea, the Arru, Ké, and other islands, as well as by those from Celebes and Singapore. Tripang and edible birds' nests are the principal articles of trade.

There is no Dutch settlement on Goram and Matabela. The natives are governed by their own chiefs and are principally engaged in making coco-nut oil, and betel-nut paste.

Ké islands consist of the large island of Ju-ud or Great Ké, the two smaller ones Nuhu Roa and Dulan, and a number of islets which are situated about 180 miles south-east of the Banda isles, and about 70 from the coast of New Guinea. Great Ké has a length of nearly 50 miles, and a width of from 3 to 6 miles, Nuhu-Roa and Dulan, which lie parallel to the west coast of Great Ké, and are separated from each other by a very narrow strait, being 15 to 12 miles long, and from 4 to 8 miles broad.

These islands consist almost entirely of coralline limestone, covered with magnificent forests, which contain an abundance of fine timber trees, some of them said to be superior to the best Indian teak, Great Ké is mountainous, the land rising gradually from sandy beaches on either coast towards the centre, where a long ridge or back-bone from 2,000 to 3,000 feet in height, extends through the island from north to south. The remaining islands are comparatively low and encircled by extensive shoals. The inhabitants are for the most part true Papuans, a mixed race—said to have come originally from the Banda isles—being found only on the coast. They are famous boat-builders, and traverse the entire archipelago, as far west as Singapore, in all seasons and weathers. Eli (north-east coast of Great Ké), and Dula (north-west coast of Dulan), are the chief centres of this industry. These islands are but little cultivated, and the only trade is in coco-nut oil.

The vessels of the *Netherlands India Steamship Company* call at Dulan every third month.

Arru islands, about 70 miles west of the Ké islands, and separated from them by a deep sea, may be said to consist of one large central island and a number of small outlying ones, most of them on the east side, where they form a continuous chain, distant some 10 to 15 miles from the mainland. The central island is in reality four distinct islands, being traversed from east to west by three narrow straits of a mean width of from 200 to 500 yards.

The whole of the Arru group is low, especially on the western side —where the land is only a few feet above the sea—whence it rises in a somewhat undulating manner, broken by abrupt limestone hillocks, and steep narrow ravines, towards the east coast, where the greatest height is perhaps 200 feet. A dense forest clothes the whole of the islands, which are watered by many small streams, flowing, as a rule, north and south into the intersecting creeks. The indigenous natives resemble the northern tribes of Australia, and have attained a greater degree of civilization than is usually found amongst aborigines; there are also many Malays, half-caste Javanese, and natives of other islands settled on the coasts. The importance of the Arru islands consists in the valuable fisheries which exist off the east coast, and which comprise the shell-tortoise, mother-of-pearl, pearl-oyster, and tripang, while from the rocky caverns which line the coast, quantities of edible birds' nests are obtained. The climate is very unhealthy, the water being of inferior quality, and during the trading season (January to July) cases of *beri-beri* are not uncommon. September and October are the only dry months.

Dobbo is the great commercial centre for the trade of the whole chain of islands lying between Timor and New Guinea, as well as for the sonth-west coasts of the latter island itself; it is visited during the trading season, which sets in with the north-west monsoon, by several thousands of Bugis, Ceramese, Chinese, and other traders. The annual value of the exports, mentioned above, is about £18,000. Fish, fowls, onions, and bananas are procurable.

The vessels of the *Netherlands India Steamship Company* touch every third month.

Serwatti islands.—Under this name—which comprises the remaining islands of the Moluccas—are generally included the long chain of islands which extend from the east end of Timor towards the Arru islands, and which terminate in the Tenimber or Timorlaut group. These islands may be said to be divided into two nearly parallel chains, which approach each other off the coast of Timor, whence they gradually open out, and trend in a north-easterly direction. In the northern chain the principal islands are Wetta, Roma, Damma, Teon, Nila, and Serua; while those of the southern are Kissa, Letti, Moa, Lakor, Sermatan, and Baba.

The northern chain is, as a rule, rocky and mountainous, the hills being often bare of trees, and the soil poor and sterile. All the islands are, however, pretty thickly inhabited, and many of the natives are Christians. The largest island is Wetta, with bleak, barren mountains on the northern coast from 2,900 to 3,900 feet in height. There is but little cultivated ground, and the natives are chiefly occupied in fishing. The southern chain of islands is of much lower elevation; the hills are generally well-wooded, and there are some extensive plains of good pasturage, as also a considerable amount of cultivation. Moa and Baba are the largest in this group. All these islands have a large and semi-Christianised population, who are much engaged in agricultural pursuits. The cattle of Moa and Letti are of a superior breed to any in this part of the archipelago.

The Serwatti islands are subject to the Assistant Resident of Banda, who visits such of them as are not occupied by the Dutch every year, for the purpose of settling disputes, &c. The islanders are divided into three classes, the *Marne*, or lords of the land, from whom the chiefs or rajahs are appointed by the Government; the *Boerstam*, who occupy an intermediate position, subordinate to the first-named, and the *Lascars*, or former slaves.

Nearly all these islands are visited by traders from Makassar, there being a considerable commerce in beeswax, pearl, tortoise-shell, and tripang.

The vessels of the *Netherlands India Steamship Company* touch every third month at Wetta, Damma, Letti, Baba, and Kissa islands.

Tenimber or **Timor-laut group.**—This is an extensive group lying at the western extremity of the Serwatti islands, and distant only 190 miles from the north coast of Australia. The largest island of the group is Yamdena, and separated from this island to the north and south of it are the islands Larat and Selaru. To the north and west of these three principal islands is a continuous chain of outlying islets, only two of which—Molu and Sera are of any importance.

These islands are with few exceptions low, the coast, which is much indented and encircled by reefs, being covered with coco-nut palms and thickets of mangroves, and fringed by precipitous coral bluffs from 60 to 80 feet high. On these heights the villages are placed, and behind them stretches a thick and shrubby forest. There are said to be no fresh-water streams, and the climate is unhealthy. The natives are a mixed race, and tall, but they are hostile to strangers, and till within the last ten years have had scarcely any intercourse with Europeans. There are valuable fisheries off the coast.

Vessels of the *Netherlands India Steamship Company* call at Larat and Sera four times a year.

New Guinea.—The island of New Guinea, which forms as it were a connecting link between the Eastern Archipelago and the Polynesian Group, lies immediately south of the Equator, and north of Australia, from which it is separated by Torres strait, 80 miles in width. On the north it is washed by the North Pacific, and on the south by the Arafura sea and the South Pacific.

Into the precise boundaries of the English and German Protectorates which have been recently extended over the eastern half of New Guinea it is not necessary here to enter. The remarks in this work will only refer to that portion of the island which lies west of the 141st degree of east longitude, and over which Holland's claim to jurisdiction is recognised.

The island, which at the Dutch boundary has a width of about 400 miles, stretches out to the westward in a long and gradually narrowing peninsula, into which the great bay of Geelvink penetrates so deeply from the north as to leave in about long. 135° E. an isthmus little more than 20 miles in breadth; further west, the peninsula, which has again expanded, is nearly cut in two by McCluer's inlet, which, making inland from the west leaves only a neck of land some 30 miles broad intervening between it and the western side of Geelvink bay. The north coast is generally mountainous, as is also the extreme west of the above peninsula, while the south coast, from longitude 135° E. to the eastward is low and swampy, covered with gigantic trees, and bordered by a broad belt of mud banks which stretch 9 to 10 miles to seaward. The entire coast line westward of long. 135° E., as far round as the eastern entrance of Geelvink bay, is fringed by a succession of islands, many of them of considerable size, and so closely adjoining the main land, as not infrequently to be taken for it. So far as has yet been ascertained, there are no traces of volcanic action or formation, the rocks chiefly met with being slate and limestone. The interior of the island is little known, but it is covered with dense forests, as is also the greater part of the shores.

The only Dutch settlement known to exist at present is that at

Dorei bay, a small inlet on the western shore, and just within the entrance to Geelvink bay; it is believed to be a coaling station for the Government vessels cruising in these waters, but there are no particulars concerning it.

In 1889 there were reported to be seven Mission stations in New Guinea.

The chief trade is in tripang and tortoise-shell, birds of paradise, skins, dammar, and *masoi* bark. Vessels of the *Netherlands India Steamship Company* call at Segaar bay and Sekru on the west coast once in three months. *See* also Pacific Islands, Vol. I., 2nd Edition, 1890.

PREVAILING WINDS and WEATHER.—Philippine islands, Sulu and Celebes seas.—The two regular monsoons that are met with in the China sea, prevail over the Philippine islands, the Sulu sea, and the northern part of the Celebes sea, but they blow with diminishing force as lower latitudes are reached, the winds south of latitude 4° N. being more variable, and often similar in direction to those of the Molucca channel.

In the regions above mentioned the N.E. monsoon begins about October with fine weather, becoming well established a month later; it lasts until April, when it falls light and varies to the northward, but if it should veer occasionally to the N.W. it blows hard. The high land of the Philippines naturally interrupts the regular course of the wind, and under the land calms are frequent, and often a light wind blows from the westward, while in front of the open channels it blows hard, especially off cape Kalavite.

In the Sulu sea the east or north-east monsoon is not a steady fresh breeze, but often variable. Near Mindanao the northerly winds never blow fresh, and light changeable winds often displace them for several days. The S.W. monsoon commences in May, and becomes regular in June. During this monsoon the weather is gloomy and very wet. About the end of July or middle of August, and sometimes in October, bad weather occurs, and severe storms called "*collas tempestados*," which are generally accompanied by thunder and lightning, and are not unlike typhons. In September the wind loses strength, the rain is less, and the sky is fine, but in the mornings there is a thick fog which lasts till noon. At the change of the monsoons bad weather is felt at times, as in the China sea.

At the commencement of the westerly monsoon the winds are light for some time, with heavy rain, during which the wind blows from an opposite direction, lasting, from the eastward, sometimes for above a week. Occasionally heavy storms happen until the westerly winds become established. During the whole of this monsoon the weather is cloudy, rainy, and at times stormy, and in this season between Celebes and Mindanao, sudden storms take place from N.W. The westerly winds occasionally last till November.

Much rain falls about Basilan and the north end of Celebes island, whilst fine but overcast and sultry weather occurs in the middle of the Celebes sea.*

Molucca channels.—In these seas also two monsoons are distinguished, which seamen call the N.W. and S.E. monsoons, some saying that the winds hang more to the northward than to westward, and more to the southward than eastward. The first corresponds to the N.E. monsoon north of the equator, the second to the S.W. monsoon. It is known indeed that the monsoons which prevail in these channels are much less regular than in the open sea; and that according to the time of year north and west winds prevail in turn, as well as those from south and east during the other monsoon. It may be noticed generally in these seas that south of the equator, as far as 10° or 12° S. latitude, the direction of the wind varies 10 or 12 points from that of the prevailing wind north of the equator at the same time; that is, if a ship north of the equator have the wind from N.E., another ship south of the equator will have it from W.N.W., and if the first ship have the wind S.W., the latter will have it E.S.E. or east. But to avoid confusion arising from the different names of the monsoons, the old names of the N.W. and S.E. are here preserved according to the case in question.

The general law observed in these seas is, that the N.W. monsoon commences in the first part of November and does not attain its height till December. It continues till the end of March, a time when calms, light winds, squalls, and rain occur. The S.E. monsoon commences in April, gradually increasing till May; it ends in October, when the winds become variable. This monsoon is subject to calms, and the wind is not so strong as that of the N.W. Besides this, the changes of the monsoons do not take place at regular periods.

North of Buru and Ceram the south-east monsoon varies from S.S.E. to S.S.W.; at Amboina from east to S.E., bringing the rainy season on the south coasts of these islands. The north-west monsoon, called in this locality the "west monsoon," varies from W.S.W. to N.W. and is the season of storms and rain on the north sides of these islands.

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* Navigation of Indian Ocean, &c., by Captain A. B. Becher, R.N., 3rd Edn.; also information from Captains H. Ellis, J. W. B. Darke, and H. Craik, of the *Eastern and Australian Steamship Company* 1888.

Banda and Arafura seas.—In these seas the south-east monsoon blows with much regularity, and towards the middle of it, from May to August, it varies from S.S.E. to S.E., and is then strong, with a high sea. The Malays call this the *white season.* In the beginning and towards the end of this monsoon the wind is due east, and sometimes veering to E.N.E. During this monsoon the wind is generally fresh and steady, when the moon quarters, and we find calms and unsettled weather at the time of the syzygies. This fact has also been observed in the trade wind of the eastern coast of Australia.

The north-west or westerly monsoon, which commences in December, may be expected to blow with strength and some regularity towards the latter end of that month; in January and February it is at its height, but declines in the latter month, until the beginning of March, when it becomes variable, with dark, cloudy, and unsettled weather; the wind is then generally from S.W., but not at all regular. The westerly monsoon is the rainy season, when there are occasionally violent squalls, with thunder and lightning; and may be considered the unhealthy season.

Near the north coast of Australia, between capes York and Van Diemen, the monsoons are not so regular; but take more the character of land and sea breezes, and the nights are mostly calm. In the months of April, May, and June, after a calm night, the land wind usually springs up at daylight from south or S.S.E., gradually becoming more easterly as the sun approaches the meridian, when there is sometimes a light wind from the eastward or calm, and at others a fresh sea breeze sets in from east and N.E., which lasts until sunset, and then falls to a calm, which continues throughout the night, except at a short distance from the land, where there are light winds.

New Guinea.—On the west coast of New Guinea there are also two monsoons, the S.E. lasting from April, to October, and the N.W. beginning with the end of October and terminating towards April. In October the weather is often changeable. In January, near this island, the wind sometimes varies from N.N.W. to N.E. In March, April and May it is squally. From June to September a great deal of rain falls; from October to May the weather is fine and calm, without either cloud or fogs.

GENERAL REMARKS.—From the foregoing the following general remarks on the winds and weather of the Eastern archipelago have been deduced.

North of the equator.—North-easterly winds prevail from December to March inclusive. This is the fine season, the winds blowing strong and steadily except in the Sulu sea, where variables prevail.

Southerly winds prevail from May to September inclusive. This is the wet season, and the winds are variable in force and direction, with bad weather. Sudden and violent squalls from the north-west occur in the Celebes and Sulu seas.

October and November are unsettled months; the north-east monsoon not being fairly established before the middle of December.

South of the equator.—West and north-west winds veering to north-east prevail from November to March. On coasts having a northern aspect, land and sea breezes, with unsettled weather and rain, will be found.

South-east and east winds prevail from May to September, generally fresh and steady, with fine weather on coasts with a northern aspect, but bringing rain and bad weather to coasts open to the southward.

Rainy seasons.—In this archipelago, situated as it is in the vicinity of the equator, and within the regions of calms and doldrums caused by the meeting of the northern and southern wind systems, the wet and dry seasons are not strongly contrasted, as a great amount of rain falls more or less all the year round. The same monsoon is often stormy at sea but fine near the land; as a rule, bad weather with rain is felt on coasts and islands that lie to windward, whilst leeward coasts enjoy fine weather.

GALES of the PHILIPPINE ISLANDS.—The following description is extracted from a pamphlet by Captain Villavicencio, who studied the subject during many years in the Philippines.* The gales of the Philippines may be separated into three classes, known by the local names of *Colla*, *Nortada*, and *Baguio*. The *colla* is a gale in which the wind blows constantly from one quarter, but with varying force, and alternations of violent squalls, calms, and heavy rains, usually lasting at least three days; these gales occur during the south-west monsoon, and their direction is from the south-west quarter.

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* Baguios: Memoria redactada por el teniente de Navió D.M. Villavicencio, jefe de la comision Hydrográfica de Filipinas, año 1874. Referred to also in the Spanish Derrotero,

The *nortada* is distinguished from the *colla* in that the direction of the wind being constant also the force of it remains steady as as well, without the alternations of passing squalls with calms at intervals which characterise the *colla*. The *nortada* is nearly always indicative of a typhoon passing not very far off. These gales occur chiefly in the northern islands, and their direction, as the name implies, is from the northward.

Baguio is the local name for the revolving storm known as *typhoon* in the China seas, which being the more familiar term the extracts will be continued under this name.

TYPHOONS of the PHILIPPINES.—These storms have their origin to the eastward or south-eastward of the Philippines, whence their course is westward, with a slight divergence to the north or south, the average direction appearing to be west by north. Some of the storms that cross the Philippines break up in the China sea, whilst others reach the China coast and recurve to the northward, and afterwards to the north-eastward. They occur in all months of the year, but the greater number take place about the time of the equinoxes, and especially, with greater violence also, at the autumnal equinox. On an average two or three occur every year, and sometimes one follows another at a very short interval. It is believed that when one of these typhoons passes in a high latitude in September there will not be another in October that year, but that one may be looked for in November in a lower latitude.*

These tempests are not encountered in latitudes below 9° N.; those of November, and of the spring equinox occur mostly in the lower latitudes, those of October move to the northward, and those of September, again, more to the northward than the October ones. This is not an invariable rule, but a tendency in that direction has been observed.

The rate of progress of these storms is about 13 miles an hour; in none of those observed has it exceeded 14 miles, nor fallen below 11 miles. The diameter of the exterior revolving circle of the storm varies from 40 to 130 miles. The diameter of the interior circle or calm region may be estimated at 8 to 15 miles. The duration of the true typhoon at any one place is not longer than 10 hours, and generally is much less. These storms are always accompanied by abundant rain, with low, dense clouds, which at times limit the visible horizon to a few yards distance, and are generally accompanied with electrical discharge.

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* The number two or three probably refers to well-determined typhoons. From observations made at the meteorological observatories at Manila, Hong Kong, and Shanghai (Zi-ka-wei observatory) it appears that about thirteen typhoons are annually experienced in these regions.

The barometer falls slowly for some days before the typhoon, then falls rapidly on its near approach, and reaches its lowest when the vortex is at a little distance; it then rises rapidly as the vortex passes away, and slowly when it has passed to some distance off, and finally regains its normal height, while near the vortex there are usually marked oscillations. The typhoon generally begins with a northerly wind, light drizzling rain, weather squally and threatening, a falling barometer, and the wind veering to the eastward when the observer is to the northward of the path of the storm, and backing to the westward when he is to the southward of it; wind and rain increasing as the wind shifts the storm generally ends with a southerly wind after falling gradually.

The above description applies especially to the typhoons as they cross the Philippine islands. A fully detailed account of the development and paths of these storms as they reach the China coast and are deflected to the north-east will be found in the China Sea Directory, Vol. II.*

The following warnings of the approach of a typhoon, and directions for avoiding the most dangerous part of it, are quoted from that work as being equally applicable here :—

"In the China sea the earliest signs of a typhoon are clouds of the cirrus type, looking like fine hair, feathers, or small white tufts of wool, travelling from east or north, a slight rise in the barometer, clear and dry hot weather and light winds."†

These signs are followed by the usual ugly and threatening appearance of the weather which forebodes most storms, and the increasing number and severity of the gusts with the rising of the wind. In some cases one of the earliest signs is a long heavy swell and confused sea, which comes from the direction in which the storm is approaching, and travels more rapidly than the storm's centre.

The best and surest of all warnings, however, will be found in the barometer. In every case there is great barometric disturbance. Accordingly, if the barometer falls rapidly, or even if the regularity of its diurnal variation be interrupted, danger may be apprehended.

No positive rule can be given as to the amount of depression to be expected, but at the centre of some of the storms the barometer is said to stand fully two inches lower than outside the storm-field. The average barometric gradient near the vortex of the most violent of these storms is said to be rather more than one inch in 50 nautical miles.

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* *See also* the "Barometer Manual" issued by the Meteorological Office, 1885.

† Mr. W. Doberck, Government Astronomer, Hong Kong.

As the centre or vortex of the storm is approached, unless the vessel be on the line of its advance, the more rapid become the changes of wind, till at length, instead of its direction altering gradually, as is the case on first entering the storm-field, the wind flies round at once to the opposite point, the sea meanwhile breaking in mountainous and confused heaps. There are many instances on record of the wind suddenly falling in the vortex and the clouds dispersing for a short interval, though soon the wind blows again with renewed fury. Few vessels have ever passed through the vortex without losing either masts or rudder, or meeting with some worse disaster, and therefore, at whatever cost, the central part of the storm-field should be avoided.

The first care of the commander of a vessel caught in a typhoon will be to find how the centre bears from him. There is now much evidence to show that in the outer parts of a cyclonic disturbance there is considerable indraft, and that the winds blow towards the central portion in a spiral form.

When, therefore, the falling barometer and other signs create suspicion that a typhoon is approaching in the northern hemisphere, face the wind, and take 10 or 12 points to the right of it, and that will be the approximate bearing of the centre. Thus, with the wind N.E., the centre will probably be from South to S.S.E. of the vessel's position.

After *the barometer has fallen five or six-tenths of an inch* it is probable that the wind then blowing forms part of the central storm circle, and the bearing of the centre may be taken as eight points from the direction of the wind. It has been said that the seaman's first care will be to know how the centre bears. His next care will be to know on which side of the storm's path his vessel is situated, and the direction in which the storm is moving. In the northern hemisphere if she be situated on the right-hand side or semicircle of a storm travelling to the westward—looking in the direction to which the storm is travelling—the wind will veer N.E., E., S.E., S., &c., or with the hands of a watch ; on the left-hand side the wind will back N., N.W., W., &c., or against the hands of a watch.*

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* The terms "veering" and "backing" applied to the wind, may be explained with reference to the movements of the hand of a watch, the former signifies shifting in the same direction as the hands, and the latter in the opposite direction. The terms have the same meaning in the two hemispheres.

In speaking of the shift of wind, such a shift is meant as would be observed on a vessel hove-to; for if the vessel be moving faster than the storm, and in the same direction, the shift may be in the opposite direction to what has been stated.

If while the vessel is hove-to the wind be found to remain in the same direction, increase in violence, and be accompanied by a falling barometer, it is probable she lies in the path of the advancing storm —the most critical of all positions.

The wind in front of the storm-field blows towards the path on one side, and away from it on the other. Consequently, if we suppose the cyclone to be bisected by a line representing its path, a little consideration will show that in the semicircle on one side of the path, a ship running before the wind may probably be brought to cross the path of the storm in front of its centre, and therefore under circumstances of the greatest danger; in the semicircle on the other side of the path a ship running before the wind will probably cross the path in rear of the céntre. If, however, the incurving of the wind should be great, running directly before the wind would be attended by danger should the progressive movement of the cyclone be slow. Endeavour should therefore always be made to keep the wind on the starboard quarter. The former of these semicircles, as above defined, has been called the "dangerous" semicircle; the recurvature of the path always takes place towards the side on which it is situated, which, in the northern hemisphere, is to the right of the storm's path. Hence so long as the vortex is travelling to the West, the winds in front of the advancing centre are North-easterly; as the vortex turns to the North, the winds in front are Easterly; and after it has turned to the Eastward the winds in front are South-easterly.

It is difficult to estimate the distance of the centre of the vortex from a vessel. This partly arises from the uncertainty as to the relation between the bearing of the centre and the direction of the wind, and greatly from there being no means of knowing whether the storm be of large or small dimensions. If the barometer falls slowly, and the weather only gradually gets worse, it is reasonable to suppose that the centre is distant; and conversely with a rapidly falling barometer and increasing bad weather the centre may be supposed to be approaching dangerously near.

Practical rules.—When in the region, and in the season of revolving storms, be on the watch for premonitory signs. *Constantly and carefully observe and record the barometer.*

When there are indications of a typhoon being near, heave-to, and carefully observe and record the changes of the barometer and wind, so as to find the bearing of the centre, and ascertain by the shift of wind in which semicircle the vessel is situated. Much will often depend upon heaving-to in time.

When, after careful observation, there is reason to believe that the centre of a typhoon is approaching, the following rules should be followed in determining whether to remain hove-to or not, and the tack on which to remain hove-to :—

Northern hemisphere.—If in the right-hand semicircle, heave-to on the starboard tack. If in the left-hand semicircle, run, keeping the wind if possible, on the starboard quarter, and when the barometer rises, if necessary to keep the ship from going too far from the proper course, heave-to on the port tack.

When the vessel lies in the direct line of advance of the storm—which position is, as previously observed, the most dangerous of all—run with the wind on the starboard quarter. And in all cases act so as to increase as soon as possible the distance from the centre; bearing in mind that the whole storm-field is advancing.

Heaving-to.—If the ship be in the right-hand semicircle, heave-to on the starboard tack. In the left-hand semicircle, heave-to on the port tack; these being the tacks on which the ship will "come up" as the wind shifts.

In receding from the centre of a typhoon, the barometer will rise and the wind and sea subside.

It should be remarked that in some cases vessels may, if the storm be travelling slowly, sail from the dangerous semicircle across the front of the storm, and thus out of its influence. But as the rate at which the storm is travelling is quite uncertain, this is a hazardous proceeding, and the seaman should hesitate and carefully consider all the circumstances of the case, particularly observing the rate at which the barometer is falling, before he attempts to cross.

Hurricanes, on North Coast of Australia.—*See* pages 493 and 529.

CURRENTS AND TIDES.

Equatorial currents.—The waters of the Pacific ocean between the parallels 26° S. and 24° N. have a regular motion from east to west, which is known as the equatorial current; this at a little to the northward of the equator would appear to be divided into the north and south equatorial currents by the equatorial counter-current, a stream flowing from west to east throughout the Pacific ocean. The currents in the western parts of the Pacific to the northward of the equator are affected by the monsoons, and to the southward of the equator they are deflected by the east coast of Australia.

Japan stream.—The trade-drift, which flows to the westward between the parallels of 9° and 20° N., on reaching the eastern shores of the Philippine islands, recurves to the northward, forming near the northern limit of that group the commencement of the Japan stream. The main body of the current then flows along the east coast of Formosa, and from that island pursues a north-easterly course through the chain of islands lying between Formosa and Japan, sweeps along the south-eastern coast of Japan, and continuing in the same general direction is known to reach the parallel of 50° N.

The limits and velocity of the Japan stream are considerably influenced by the monsoons in the China sea, and by the prevailing winds in the corresponding seasons in the Yellow and Japan seas; also by the various drift-currents which these periodic winds produce. These variations are exhibited on the Admiralty current chart,* which embodies, in a graphic form, all the most reliable information we possess. For further details of this current *see* China Sea Directory, Vol. III.

Current east of Mindanao.—Alternate currents dependant upon the prevailing monsoon, exist between the equator and the southern limit of the northern equatorial current, and from the meridian of 142° E. to Waigiu, Gillolo, and the Philippine islands. These are sometimes called the currents of the Caroline-monsoons, because the maximum speed of this current, toward N.E. and E.N.E., is observed a little to the westward of the Caroline islands during the S.W. monsoon (from June to October); but during the N.E. monsoon (from October to May), the current sets to S.W. and W.S.W., and forms a prolongation of the northern equatorial current.

Equatorial counter-current.—This counter-current is an irregular stream, setting towards the east; it is about three hundred miles wide, and lies between the northern and southern equatorial currents. Though the limits of the counter-current are imperfectly defined, it appears to be comprised between the equator and the parallel 8° N.; the greatest width of its bed is never more than 5° of latitude. In the eastern part of the Pacific it generally keeps between 5° and 8° N., while in the Central Pacific it is generally nearer the equator.

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* *See also* Admiralty Atlas:—Wind and current charts of the Pacific, Atlantic, and Indian Oceans.

It sets towards the east with a speed of sometimes 2½ miles an hour; but its rate is ordinarily much less, the mean speed being about half a mile.

The south equatorial current flows to the westward between the parallel of 24° S. and the equatorial counter-current, and extends through the Solomon group to the north-eastern coasts of New Guinea.

The Rossel current is a branch of the south equatorial current, and receives its name when near the meridian of 175° W. It passes, to the southward of the Fiji islands, and when between them and New Caledonia, sets N.N.W. towards the Solomon group, and N.W. as far as Torres strait, with an average rate of 8 or 10 miles a day.

China sea currents.—The currents of the China sea appear to be caused by the wind; during the N.E. monsoon they trend generally to the S.W., and during the S.W. monsoon to the N.E. For details of these currents *see* China Sea Directory, Vol. II. During the N.E. monsoon a counter-current often flows to the North-east and North on the north-west coast of Borneo, and N.E. of the Natunas. This counter-current can often be utilized while beating up the China sea against the monsoon.*

Sulu sea.—During the north-east monsoon in the Sulu sea the current runs regularly in the direction of the wind, and varies in strength according to the force of the wind. In the early months of this monsoon, when the wind blows strongest, the current runs with the velocity of a mile an hour, decreasing to about half a mile an hour in May. In June the current reverses with the wind.

In the Molucca passages the current sets with the wind, its strength depending very much on the force of the wind, seldom exceeding a knot an hour. During the north-east monsoon of the northern hemisphere it appears to be stronger on the east coast of Celebes than on the west coast of Gillolo. On the north coast of Ceram counter-currents prevail close in shore during the south-east monsoon of the southern hemisphere.

Banda and Arafura seas.—During the south-east monsoon the current sets to the north-west along the western coast of New Guinea, and between the Ké and Arru islands, and thence westward along the south coast of Ceram, at the rate of one or 1½ miles an hour, according to the strength of the wind, the velocity being greatest along the coast of New Guinea. At the same period an easterly current prevails on the north side of the islands extending from Timor to Timor Laut, so that a moderately fast sailing vessel would experience no difficulty there in beating up against the monsoon. In the north-west monsoon, the current in these seas usually sets with the wind.

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* On the passage of H.M.S. *Challenger* from Manila to Hong Kong in November 1874, as well as on the return voyage in January 1875, the surface temperature was found to be 3° higher within 60 miles of the coast of Luzon than it was at a greater distance from that island, and this change of temperature was sudden, taking place in the voyage to Hong Kong in a distance of 10 miles, and in the return voyage in 6 miles. On each occasion, so long as the ship was in the belt of warm water, a northerly current was experienced. See *Challenger* Report, Vol. I. p. 646.

TIDES.—China sea.—The observations on tides in the China sea are neither numerous enough nor complete enough to permit of accurate generalizations being made for the whole area. The following remarks, however, based on the existing evidence, afford some idea of the general tidal movement.

The tides are very complex, giving an idea of irregularity without law, which is, of course, erroneous.

They are affected by a diurnal irregularity, especially of height, causing a difference between the heights of successive high and low waters, which varies throughout the duration, and sometimes attains large proportions.

The difference may be almost imperceptible, or may be so great that the movement of the water between the lower high water and higher low water is reduced to a mere stand in the level of the water, giving the effect of only one high and low water during the 24 hours.

The time of high water is generally the most regular feature of the tides, and follows the time of the moon's transit as usual.

Spring tides depend upon the opposition and conjunction of the moon and sun (full or new moon), and also on the attainment by the moon of her higher declination north or south.

The effect of these two positions of the moon is about equal on the tide, so that when the moon is either new or full, at the same time that she is in high north or south declination, the spring tide is high and well defined. When the new or full moon occurs when she is on the equator, the spring tide is sometimes almost lost, and the tide does not rise so high.

This is equivalent to saying that the higher and best defined spring tides occur about the solstices (June and December), and the lower and least defined about the equinoxes (March and September).

The higher water of each day follows either the superior or inferior transit of the moon when she is on one side of the equator, and the opposite transit when she is on the other side of the equator. The particular transit followed by the tide varies in different localities.

On the north-west coast of Borneo; among the Philippine islands; and in the Tong King gulf, when the sun has north declination, the higher tides about spring occur during the day, and when it has south declination, during the night.

The mean tide level on the different coasts varies during the year; on the coast of Luzon it is lowest in February and highest in August; in the Tong King gulf it is highest during the north-east monsoon, or from November to March; and about Kin Hon, on the coast of Cochin China, it is lower in May and June than in March.

On the coast of Luzon, on the island of Paláwan, and on the northern part of Borneo, it is high water full and change between 9 h. 30 m. and 11 h.; rise 3 to 6 feet. In the northern part of the Sulu sea, at Iloilo and Sebu, and on the north-east coast of Borneo it is between 11 h. 30 m. and 12 h. In the straits of San Bernardino and Surigao, on the south coast of Mindanao, and in the Sulu archipelago the tidal wave arrives from 6 h. to 8 h.; and in the Celebes sea from 5 h. to 6 h.; rise 6 to 7 feet.

The observations on the tides in the Molucca and Banda seas are too few to afford data for generalization.

The Philippines.—The following information concerning the tides of the Philippines is extracted from the Spanish Derrotero:*

The tides of Manila, Iloilo, Surigao strait, and Balábac follow the general laws stated above. Two or three days after the moon has crossed the equator, two high and two low tides are observed in the 24 hours, of nearly equal amplitude; during the following days one tide increases in amplitude, and the other decreases until but one occurs in the 24 hours.

Two or three days after the moon has attained its greatest declination, either north or south, the single tide that exists attains its maximum. It then decreases in amplitude with the declination of the moon; soon, a second tide appears, the amplitude of which increases as the other lessens, and the two tides are equal two or three days after the moon has recrossed the equator; then, the first continues to lessen while the second increases until again there is but one tide in the 24 hours.

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* *See also* a paper on the same subject by Sr. Don Francisco Carrasco with a diagram.—*Naut. Mag.*, June 1868.

There can hardly be said to be a regular "establishment" as it varies daily for each of the two diurnal tides according to the positions of sun and moon; but, in the appendix a table will be given in which may be found the approximate tide hour for each day of the year at Manila, Iloilo, and Balábac.

The tides on the South coast of Mindanao present the following peculiarities:—the diurnal wave is propagated more slowly than the semi-diurnal, and increases in amplitude on advancing from Davao to Basilan strait, whilst the semi-diurnal wave decreases in amplitude. The diurnal inequality makes itself very apparent in the heights of the flood-tides, and in the hours of the low-tides, and is but little apparent in the height of the low tides and the hours of the flood tide.

As a result of these laws and of the values of the diurnal inequalities there are, at Davao and Palak always two tides daily, except at the time of certain equinoctial quarters when the moon has a maximum declination. At Samboanga there will generally be two tides daily, but one only at every equinoctial quarter. At Isabela the difference is more marked: there are some years (being those in which the moon attains its greatest declination) in which the number of days having but one tide in the 24 hours, exceeds the number of days having two tides. In all cases, however, there are always two equal tides in the 24 hours one or two days after the moon has passed the equator.

In the course of one day the higher high tide, when there are two, and the single high tide when there is only one in the day, is that which immediately follows the hour of the moon's superior or inferior transit according as her declination is south or north.

In the Appendix a table will also be given for finding the approximate tide hour for each day of the year at Davao, Palak, Samboanga, and Isabela.

COALS can be obtained at the following ports:—Manila, Iloilo, Sebu, port Isabel (by the authority of the officer in command at Samboanga), Sandakan, Ternate, Amboina, and Koepang in Timor; a small depôt of coals is kept at Gisser in Ceram Laut, Dobbo in the Arru islands, Dorei in New Guinea, and Baba in the Serwatti islands, but can only be utilized on the authority of the Resident of Amboina; a small quantity of coal, under 400 tons, is also kept at port Darwin and Thursday island.

COMMUNICATIONS.—Spanish Colonies.—A Spanish mail steam-vessel runs monthly from Manila to Singapore and

Barcelona. Steam-vessels run between Manila and Singapore twice a month, and between Manila and Saigon twice a month. Steam-vessels run between Manila and Hong Kong at intervals of three or four days; these vessels generally call at Amoy.

Local traffic among the Philippines is carried on by about twenty steam-vessels, having their head-quarters at Manila. One line runs from Manila to ports on the N.W. coast of Luzon twice a month; another from Manila, through Verde island passage, to ports on the south coast of Luzon, and through San Bernardino strait to Albai and Tobako, twice a month; a third line calls at the ports in Panay island, Sebu, and Leite, as far as Takloban, twice a week. Besides the above, there is frequent communication between Manila and Iloilo.

A steam-vessel runs monthly from Manila to Iloilo, Samboanga, the ports in the Sulu archipelago, and the southern ports of Mindanao to Pujada bay. A small steam-vessel calls at port Kulion in the Kalamianes, Cuyo, and Paláwan, once a month, on her passage to Kagayan-Sulu, Sulu, and Samboanga, and again on her return voyage.

North Borneo is in communication with Labuan and Singapore once a week, with Hong Kong about three times a month, and with Sulu about twice a month.

Dutch colonies.—From Batavia and Sourabaya a monthly line of steam-vessels trades to Makassar and the ports in the Moluccas, and a three-monthly line runs to Timor, Timor-Laut, Ké, and Arru islands, and Segaar bay in New Guinea.

North Australia.—The Eastern and Australian steam-vessels, and the China Navigation steam-vessels visit port Darwin on their passage from Hong Kong to the southern ports of Australia, not at stated intervals, but on an average about once a week. Occasionally these vessels call at Singapore or Batavia *en route.*

Telegraphs.—Manila is in telegraphic communication with Hong Kong; and port Darwin with Banjuwangi and Singapore.

DIRECTIONS FOR MAKING PASSAGES.

MANILA to EUROPE.—Steam-vessels, full-powered and auxiliary, proceed from Manila to Singapore by China sea route or by Paláwan passage, according to the monsoon, and thence, viâ Sunda strait, across the Indian ocean for the Suez canal.

China sea route.*—During the N.E. monsoon, a vessel on leaving Manila bay should steer W.S.W. as far as the parallel of 12° N., but make no more southing until sure that her longitude is less than 114° E.; when satisfied that she is sufficiently to the west, she should steer for Pulo Sapatu, allowing for the westerly currents, which at this season are sometimes very strong, and set a vessel much out of her reckoning. Should Pulo Sapatu not be sighted on reaching its parallel owing to thick weather, the course should be S.W. by W. until soundings are found, and then a course steered for Pulo Aor and Singapore strait.

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* *See* Admiralty charts:—China Sea Northern portion, No. 2,661 *a*, *b*; Southern portion, No. 2,660 *a*, *b*; scale, $m = 0{\cdot}05$ of an inch.

Paláwan passage route,[*] along the west coast of Paláwan island and the north-west coast of Borneo, is about the same length from Manila to Singapore as the China sea route. Vessels taking this passage during the S.W. monsoon will avoid the strong currents of the China sea. For the conclusion of both these routes, *see* China Sea Directory, vol. II.

Sailing vessels.—During the strength of the N.E. monsoon, sailing vessels can take the route across the China sea north of North Dangers to Pulo Sapatu, making every allowance for the drift to the south-westward, and then steer for Gaspar and Sunda straits; but in March, April, and May, they are recommended to take the Paláwan passage down the coast of Borneo, as they are then likely to carry easterly winds with fine weather and a smooth sea to Carimata strait.

During the S.W. monsoon[†] sailing vessels should make through Mindoro strait or Verde island passage, Basilan strait, or Sibutu passage, and Makassar strait to Sunda strait. If unable to make Makassar strait, they can steer for Molucca passage, and pass east of the Sula islands, and Buru; but in this case it will be better to enter the Indian ocean by Ombai strait.

EUROPE to MANILA.[‡]—Sailing vessels, when the N.E.

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[*] *See* Admiralty charts:—China sea, Eastern portion, Nos. 2,661 *b*, and 2,660 *b*; scale, $m = 0·05$ of an inch; also Borneo, West coast, sheets 1 to 8; scales $m = 0·25$ and 0·5 of an inch.

[†] *See* Admiralty charts:—San Bernardino strait, No. 2,577, Sulu sea, No. 2,578, Sulu archipelago, No. 2,576, Celebes sea, No. 2,575; scales, $m = 0·1$ of an inch; Basilan strait, No. 961, $m = 1$ inch; Strait of Makassar, north part, No. 2,636, south part, No. 2,637; scales, $m = 0·1$ of an inch; Ports in Makassar strait, No. 2,662, scales various; Eastern archipelago, Nos. 942 *a*, *b*. 941 *a*, *b*; scales, $d = 2·75$ of an inch.

[‡] Eastern Routes to China: Horsburgh, 8th edition, vol. II.; China Sea Directory, vol. III., chap. I.; Navigation of the Indian Ocean, China, and Australian Seas by Captain Becher, R.N., 1864; Navigation of the Pacific Ocean, China Seas, &c.—U.S. Hyd. Office, 1875.

monsoon is blowing in the China sea, should enter the Eastern archipelago by Lombok or Ombai strait, and pass into the Celebes sea by Makassar strait; thence through Sibutu, or one of the Sulu passages, to Manila.

During the S.W. monsoon a sailing vessel can enter the strait of Sunda, and thence take the Banca, Gaspar, or Carimata strait, into the China sea as far as 12° N., when she may strike across for Cabra island.

PHILIPPINES to AMERICA.*—Vessels bound to the west coast of North America and Panama would in either monsoon do best to pass up the west coast of Luzon, through the Bashi channel, east of Formosa, into the Japan stream (Kuro Siwo), and reach the region of westerly winds in lat. 35° N. without loss of time. The route then follows the arc of a great circle as closely as possible, running up as high as 48° N. from April to November, and keeping between 40° and 45° N. from November to March. Here both winds and currents are favourable.

If bound to Valparaiso or the ports of South America, staunch auxiliary steamers will find it to their advantage to go south of Australia. They can fill up with coal at Singapore or Batavia, then pass into the Indian Ocean through Sunda or Allas strait, and make south for the steady west winds; these once found, head S.E. for the parallel on which it is intended to make easting.

Sailing vessels are recommended during the S.W. monsoon to take the northerly route by the Bashi channel, as indicated above for North America. Maury recommends to follow this route as far as 152° E., then cross the equator in 172° E., and pass either east or west of New Zealand into the westerly winds; Horsburg and Becher recommend vessels to get into long. 165° to 170° E. before they stand across into the trades.

During the N.E. monsoon a shorter route, but with less favourable winds, is to pass down the Sulu sea through Basilan strait, then north of New Guinea, keeping between the trades, and north of the equatorial currents in 2° to 4° N. as far as the Gilbert islands, and then S.E. for the westerly winds.

Another route during the N.E. monsoon is from Basilan strait through the Molucca channels and Torres straits, with the north-west winds that prevail south of the equator. (*See* "China sea to Torres strait," p. 31). After clearing Torres strait by Bligh entrance, continue along the southern coasts of New Guinea and the Louisiade archipelago until far enough east to cross the trades into the westerly winds. Vessels running north of New Zealand will have a quicker passage, but it will be difficult to double cape Otou at this season unless advantage be taken of every chance for making to the eastward as well as southward.*

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* Navigation of the Pacific Ocean, China Seas, &c., U.S. Hyd. Office, 1875, chap. V.; China Sea Directory, vol. III.; Navigation of the Indian Ocean, China and Australian Seas, by Captain Becher, R.N., 1864, chap. XV.; Horsburg, Vol. II., p. 509.

WEST COAST of AMERICA to the PHILIPPINES.†—Steam-ships and sailing vessels.—From North America all vessels going west will almost of necessity stand to the southward and westward for the N.E. trades. In summer and autumn they need not go so far south for steady trades as they do in winter and spring.

Between May and October, on gaining the trades, vessels should make westing on about the parallel of 20° N., as far as the Marianas Thence full-powered steam-ships bound for Manila might keep on through the Bashi channel and round the north point of Luzon. Sailing vessels, however, and vessels bound for Iloilo should pass south of the Marianas and steer for San Bernardino strait with the N.E. winds. These will gradually change to variable winds with squalls, and then to the S.W. monsoon as the vessel approaches the Philippines. For entering San Bernardino strait *see* Chapter VIII.

Between November and April vessels should make their westing about the parallel of 15° N., and, if bound for Manila, should pass north of the Marianas and enter the China sea by the Bashi channel.

If bound to Iloilo they can enter by San Bernardino strait.

From South America the passage may be made by either the N.E. or the S.E. trades. These two routes are called respectively the northerly and the southerly route. The former is preferred by vessels leaving Valparaiso or Callao from August to February; the southerly is the better route during the remainder of the year.

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* *See* Admiralty charts :—China Sea, Northern portion, No. 2,661 ; scale m = 0·05 of an inch ; Luzon island, with Bashi and Balingtang channels, No. 2,454, scale m = 0·1 of an inch ; Islands between Formosa and Japan, No. 2,412, scale m = 0·05 of an inch ; Pacific Ocean, S.W., N.W., N.E., S.E. sheets, Nos. 780, 781, 782, 783, scale d = 0·66 of an inch ; Eastern archipelago, Eastern portion, No. 942 *b*, scale d = 2·75 inches ; Australia, general chart, Northern and Southern portions, Nos. 2,759 *a*, *b*, scale d = 1·0 of an inch.

† The Navigation of the Pacific Ocean, United States Hydrographic Office, 1875, Chap. III. ; *See* Admiralty charts :—China Sea, northern portion, No. 2,661*b*, scale, m = 0·05 of an inch ; Luzon island with Bashi and Balingtang channels, No. 2,454, scale, m = 0·1 of an inch ; Islands between Formosa and Japan, No. 2,412, scale, m = 0·05 of an inch ; Pacific Ocean, S.W., N.W., N.E., S E., sheets, Nos. 780-783, scale, d = 0·66 of an inch.

Northerly route.—After leaving Valparaiso or Callao head with the S.E. trades to cross the line near 138° W. and 10° N. near 143° W.; the N.E. trades will be found near this parallel; thence continue as from North America.

Southerly route.—On leaving Valparaiso steer N.W. into the settled trades. These found, the route should be by the Marquesas, south of the Gilbert group, and to the northward of the Pelew islands. After this, shape course according to season as described above.

Auxiliary steam-ships can shorten the southern route by passing to the southward of the Paumotu archipelago, and after reaching about 158° W. they can pass between the Samoa and Tonga islands; but it often happens that calms or westerly winds are met with south of the Paumotu group.

CHINA SEA to the EAST COAST of AUSTRALIA.—Full-powered steam-ships should take the Torres strait route in both monsoons. *See* page 31, "China Sea to Torres strait."

In the N.E. monsoon.—Vessels with auxiliary steam can also take the Torres strait route, or they can take the passage south of Australia. In this case they pass down the China sea and between the Great and South Natunas to Carimata strait, thence through Lombok or Allas strait into the Indian ocean. They should then stand to the southward profiting by the changes of wind which in this season are generally from S,S.W. and S.S.E. between the straits and the trade winds; cross the zone of the trade winds and get into the variables of the southern hemisphere; they will then speedily make up their easting.

Sailing vessels should take the route south of Australia as above. From Hong Kong or Saigon they can pass down the China sea; but from Manila, especially in March, April and May, they had better take the Paláwan passage, then by Carimata and Lombok or Allas strait into the Indian ocean. For particulars of Carimata strait the mariner is referred to the China Sea Directory, Vol I., ch. VIII.*

In the S.W. monsoon, vessels with auxiliary steam may take the Torres straits route if they have coal endurance to steam from Amboina where they can fill up with coal, to Torres straits; otherwise, they can follow one of the eastern routes for sailing vessels. They can pass through the Bashi channel into the Pacific passing on either side of the Pelew islands, according to the extent of the S.W. monsoon to the eastward ; and, having gained the equatorial counter current between the parallels of 4° and 8° N., make easting until far enough to proceed through the Solomon group and Coral sea, and thence to the southward. Or they may pass through Mindoro and Basilan strait and then make easting between 4° and 8° N. far enough to make the Solomon islands, and thence south to Australia. For particulars of the last part of the voyage *see* "Pacific islands" Vol. I. and "Australia Directory" Vol. II.

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* *See* Admiralty charts:—China sea, Southern portion, No. 2,660*a*, *b*; Northern portion, No. 2,661*a*, *b*; scale $m = 0{\cdot}05$ of an inch; Carimata strait, 2,160; scale, $m = 0{\cdot}15$ of an inch. Eastern archipelago, Western portion, No. 941*a*; scale, $d = 2{\cdot}75$ inches; Australia, General chart, No. 2,759*a*, *b*; scale, $d = 1{\cdot}0$ inch; *also* Winds and Currents, p. 12.

Sailing vessels are recommended by Captain Becher to take one of the eastern routes just described, but in the "Navigation of the Pacific Ocean, China Seas, &c.," U.S. Hydrographic Office, sailing vessels and auxiliary steam vessels are advised to follow the route from China to Europe during the S.W. monsoon, viz. : by Mindoro and Basilan straits ; thence through Makassar and the strait of Sunda, or Molucca passage, Salayar and Lombok straits, or Gillolo passage, Manipa and Ombai straits into the Indian Ocean, and so round the South of Australia.

China sea to Torres straits.—The route now generally adopted is :—from Hong Kong to steer S.S.E. ¾ E. across the China sea for Mindoro strait, and to pass about 4 miles west of cape Kalavite ; then through Apo East Pass between Apo reef and Mindoro island—a safe and good channel ; then proceed through the Sulu sea, between Cuyos island and Sultan bank, east of Sombrero island and 6 miles west of Nogas island off the south-west extreme of Panay from this point a southerly course should be steered for the south-west extreme of Mindanao and Basilan strait, leaving the Sultan and Nicholson banks on which there are depths of 2½ and 6 fathoms to the westward. The west coast of Mindanao is steep to and quite safe.*

In passing through Basilan strait, either channel, north or south of Santa Cruz island may be taken, but the northern is preferred.† On leaving the strait a course S.S.E. ¾ E. should be steered to pass between Biarro and Banka islands of the north-east point of Celebes; the east coast of Banka is safe, and may be passed within half a mile.* Then proceed southward through the Molucca pass between the Sula islands and Obi Major, and through Manipa strait, from whence steer about S.E. by E. ½ E. across the Banda sea for the Arafura sea, passing between the Ké and Arru islands to the north-eastward, and the Tenimber island to the south-westward. Mano island, lying near this track is a high volcanic island with no dangers in its vicinity, but the south-west part of the Arru islands must not be approached within 15 miles, as the Blackburne shoals, with only one to 3 fathoms of water over them, lie some 10 miles off the coast, and are not indicated by breaking or ripplings at ordinary times.

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* *See* Admiralty charts : Hong Kong, No. 1,466 ; scale, $m = 2{\cdot}4$ inches ; China, East coast, Sheet 1, Mongchau to Hong Kong, No. 2,212 ; scale, $m = 0{\cdot}23$ of an inch ; China sea, Northern portion, No, 2,661*b* ; scale $m = 0{\cdot}05$ of an inch ; Eastern archipelago, Philippine islands, No. 943 ; scale, $d = 2{\cdot}8$ inches ; Northern portion of Luzon, No. 2,454 ; scale, $m = 0{\cdot}1$ of an inch ; Between S. Bernardino and Mindoro straits, with adjacent islands, No. 2,577 ; scale, $m = 0{\cdot}1$ of an inch ; Eastern part of Sulu or Mindoro sea, No. 2,578 ; scale, $m = 0{\cdot}1$ of an inch ; Sulu archipelago, No. 2,576 ; scale, $m = 0{\cdot}1$ of an inch ; *also* Winds and Currents, p. 12 ; and China sea Directory, Vol. III., chap. I., 1884.

† *See* Admiralty chart : Basilan Strait, No. 961 ; scale, $m = 1{\cdot}0$ inch.

From the Arafura sea a course should be steered to pass south of Proudfoot shoal at the western entrance of Torres strait, and then through Torres strait as directed in the Australia Directory, Vol. II.†

North of Ceram to Torres straits.—In order to escape the south-east monsoon during the months of July and August, when it blows strong and raises a high sea in the Arafura sea, some steamships, after passing Obi Major, have taken the passage north of Ceram, the Ké, and Arru islands, passing cape Valshe at a distance of 30 miles, as mud banks extend to a great distance from the cape. This passage has the advantage of smooth water, but is a little longer, and less well-known than the passage through the Banda sea.

From the China sea to port Darwin.—The same route as above should be followed as far as Manipa strait, whence a course S.S.E. ¼ E. should be steered to pass east of Turtle and Damma islands, and between Sermattan and Baba islands; and from Sermattan S. by E. to round cape Fourcroy. Shoals having been reported to the southward of cape Fourcroy, it should not be brought to bear north of N. by E. whilst within a distance of 8 miles. After clearing the cape a course may be shaped for port Darwin, proper allowance being made for the tides which run very strong during the springs, the flood to the eastward, and the ebb to the westward.‡

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* *See* Admiralty chart: Celebes Sea, Eastern Part, No. 2,575; scale, $m = 0{\cdot}1$ of an inch; North part of Celebes island, No. 930; scale, $m = 0{\cdot}36$ of an inch.

† *See* Admiralty charts:—Eastern Archipelago, No. 942 *a* and *b*; scale, $d = 2{\cdot}75$ of an inch: Australia, northern portion, No. 2,759 *a*, scale, $d = 1{\cdot}0$ inch; Western approach to Torres strait, No. 447, scale, $m = 0{\cdot}07$ of an inch: Torres straits Western channels, No. 2,375, scale, $m = 0{\cdot}5$ of an inch.

‡ *See* Admiralty charts:—North coast of Australia, sheet 4, No. 1,044, scale, $m = 0{\cdot}06$ of an inch; Port Darwin, No. 18, scale, $m = 0{\cdot}5$ of an inch; and Australia Directory, Vol. III.

Verde island passage. — Vessels will find the route east of Lubang island, through Verde island passage, and along the east coast of Mindoro, preferable to that through Mindoro strait. The whole course is very safe, except in the vicinity of Bakos islets, south-east of Verde islands, where caution must be used. This is a favourite route during the north-east monsoon for vessels coming from the southward, which go north under the lee of Negros and Panay, and, from the north-west point of Panay proceed between Mindoro and Tablas islands to point Dumali, and then on through Verde island passage and up the west coast of Luzon, thus escaping the strong monsoon that is generally felt on clearing Lubang islands.

Westward of Cuyos.—During the south-west monsoon of the China seas, steamers have passed from Basilan strait west of Kagayanes and Cuyos islands, and through Apo west pass into the China sea, and H.M. ships have also used the passage from the China to the Sulu seas between Kalamianes and Linapakan, and between Linapakan and Paláwan,* but these channels have not yet been properly surveyed.

Sulu sea from the Westward.—Balábac strait,† between the islands of Balábac and Banguey, north of Borneo, is taken by vessels proceeding from Singapore to the southern part of the Sulu sea. The general description of the islands of Paláwan, Balábac, and Banguey, and the reefs in the vicinity, will be found in the China Sea Directory, vol. II.; but, for the convenience of vessels proceeding to Sulu islands, or to Basilan strait, the main channel is described in this work.‡

South Banguey channel and **Mallawallé strait,** between Banguey island and Borneo, are used by vessels navigating to the ports on the north-east coast of Borneo; they are somewhat intricate and demand careful navigation, being for the greater part bounded by dangers. The description of these channels will be found in the chapter on the north-east coast of Borneo.‡

Sibutu pass.—Vessels entering the Sulu sea from Makassar strait will find it convenient to use the channel between the Sibutu islands, south of Tanjong Unsang, which is the easternmost point of Borneo, and Tawi Tawi island. This channel is 18 miles wide, quite safe, and easy of navigation both by day and night; but the tidal streams set through the channel with great force.

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* *See* Admiralty chart:—Paláwan island, No. 967; scale, $m = 0{\cdot}1$ of an inch.

† *See* Admiralty charts:—Balábac strait and channels between Borneo and Paláwan, No. 948; scale, $m = 0{\cdot}5$ of an inch; Gaya Bay to Sandákan harbour, including Banguey channel, No. 287; scale, $m = 0.24$ of an inch.

‡ *See* chapter IV.

From Manila to Iloilo.—Vessels can take the Verde island passage to point Dumali, and then steer either south along the west coast of Panay, which is considered the best route during the north-east monsoon, or, from point Dumali they may steer to pass south of Simara island, and between Tablas and Romblon, then on between Jintotolo and Zapatas islands, and then, turning southward proceed along the east coast of Panay to Iloilo. This latter route is the one preferred during the south-west monsoon.

From Manila to Sebu.—The same route would be taken as far as Jintotolo island; from there proceed to Malapascua, which lies north-west of Sebu island, and thence south to Sebu. The details of these various routes are given in Chapters V. and VI.

MANILA to HONG KONG and BACK.[*]—**During the N.E. Monsoon** steamers and sailing vessels should keep the coast of Luzon at a distance of about 3 miles as far as cape Bolinao, and then stand across for the Lema channel, south of Hong Kong. Captain Becher recommends that with N.E. or northerly winds, especially if the vessel is not a good sailer, the coast should be kept as far north as cape Bojeador before standing across for China; but the Spanish Derrotero considers it not advisable to attempt to reach as far as the cape on account of the high wind and sea off it, but advises to stand boldly across, and the current will assist with 50 and afterwards 20 miles a day to N.W. by N.; when 100 or 150 miles are made to the N.W. the wind and sea will get more handy and regular and change one or two points further east, and if the vessel does fall to leeward of Hong Kong she should enter at the Ladrones and thence reach Hong Kong.[†]

During this monsoon there is a current to the northward between Manila bay and cape Bolinao, and between cape Bolinao and the Pratas a current to the N.W. sometimes as much as 30 or 50 miles a day.

If bound to Manila in the N.E. monsoon, vessels pass through the Lema channel and keep as far east as possible, making for the north-west coast of Luzon towards cape Bolinao. At this season the current sets strongly to leeward, but is found to decrease as the vessel nears Luzon. Having reached the latitude of the cape the vessel should proceed, at a safe distance, along the coast for Manila bay.

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[*] *See* Admiralty charts:—China Sea, northern portion, No. 2,661*a*, No. 2,661*b*, scale, m = 0·05 of an inch, and northern portion of island of Luzon, No. 2,454, scale, m = 0·1 of an inch.

[†] China Sea Directory, Vol. III. p. 38; Navigation of the China Seas, &c., by Captain Becher, p. 234; Spanish Derrotero, p. 115; *also* Captain A. Polack, Nautical Magazine, June 1868.

During the S.W. Monsoon a vessel leaving Manila for Hong Kong should steer direct for the great Ladrone, making due allowance for the lee current. According as the wind, on approaching the coast is S.W. or inclines east the more weatherly of the channels between these islands should be entered.

If bound to Manila in the S.W. monsoon every possible advantage should be taken of the wind running to S.E. or east to make southing. From the Macclesfield bank a vessel is sure of reaching Manila. If passing to windward of the Scarborough shoal caution is necessary on account of the current.

MANILA to SAIGON.*—During the N.E. Monsoon the route is direct for steam ships and sailing vessels, making allowance for the current which sets with the wind.

During the S.W. Monsoon full-powered steam ships may take the direct route. Sailing vessels will find the voyage long and trying whichever route they adopt. The Spanish Derrotero recommends the following: On leaving Manila bay take the Verde island passage down the east side of Mindoro and the west coast of Panay, cross the Sulu sea passing out by Balábac strait, and work down the N.W. coast of Borneo to make westing; then cross the China sea south of the Paláwan shoals.

SAIGON to MANILA.—During the S.W. Monsoon the route is direct and the wind fair, but during the N.E. monsoon the passage will be long and tedious for a sailing vessel. Captain Polack gives the following directions which are also incorporated in the Spanish Derrotero,† stand out to the S.E. and tack, even if the wind be from east, 40 miles from land in order to keep to the westward of the current, but on no account endeavour to work up along the coast of Cochin China. When the wind hauls E.N.E. or N.E. try to cross the S.W. current as quickly as possible, for at about 150 miles S.E. by E. from Cape St. James the current runs east and E.N.E.; then work up between 20 and 70 miles to westward of the Paláwan shoals from 9° N. as far as North Danger with the aid of the N.E. and northerly current. From North Danger it is very probable that an easterly current will favour the last part of the voyage.

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* *See* Admiralty charts :—Between San Bernardino and Mindoro straits, No. 2,577 scale, $m = 0{\cdot}1$ of an inch; Paláwan island, No. 967, scale, $m = 0{\cdot}1$ of an inch; China Seas, southern portion, Nos. 2,660*a*, 2,660*b*, scale, $m = 0{\cdot}05$ of an inch.

† Nautical Magazine, June 1868.

For a well found sailing ship this route is without doubt the shortest and best, but dull sailers and steam-ships would do better to take the Paláwan passage, in which even during the height of the monsoon the wind is frequently light, and steamers can make use of their engines with advantage. *See* China Sea Directory, Vol. III.

SINGAPORE to the MOLUCCAS.*—Full-powered steam-ships would probably find it shorter to take the route south of Borneo in both monsoons, but sailing vessels should proceed north or south of Borneo according to monsoon.

N.E. Monsoon.—From October to May the N.E. monsoon blows north of the equator, and the N.W. monsoon south of it; at this season the passage should be through Carimata strait, east of Ontario reef: *see* China Sea Directory, Vol. I., and on leaving the strait a vessel should steer to pass 10 miles south of Great Solombo island, and thence south of Taka Rewataya, on which there is a *flashing* light, then south of Mansfield bank, and through Salayar strait between Sarongtang (Middle island) and Pamatata (South island). Once clear of Salayar strait, Amboina and Banda are easily reached by passing south of Hegades, Greenwood, and Binonko island; but vessels bound for Pitt passage should round the south point of Buton, and skirt along the shore until they reach the east point, passing to the west of Wangi Wangi islands. They should then bear north for Wawoni island and thence run for the south point of Sula Besi. The currents in this locality set to the south, and are very strong. If drifted to leeward of the north point of Buru, vessels should pass to the southward and eastward of that island, through Manipa strait.

S.W. Monsoon.—From May to September the S.W. monsoon blows north of the equator and the S.E. monsoon south of it. At this season a vessel should run south of the Anamba and Great Natuna islands, and then between the Royal Charlotte and Louisa shoals, taking care to avoid the dangerous shoals bordering the Borneo coast, and also the being set to leeward of Balambagan island by the northerly current which prevails in the S.W. monsoon. Having made Balambagan island haul round its north point, and steer through Balábac strait, *see* Chap. IV., then through Sibutu passage or one of the passages of the Sulu archipelago, cross the Celebes sea for the north point of Celebes island, and then work south through Molucca passage.*

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* *See* Admiralty charts:—Eastern Archipelago, western portion, No. 941*a.b* scale $d = 2\cdot75$ inches; eastern portion, No. 942*a.b.*, scale, $d = 2\cdot75$ inches; Carimata strait, No 2160, scale, $m = 0\cdot15$ of an inch.

SINGAPORE to NORTH COAST of AUSTRALIA.†—**Steam-ships and sailing vessels** should proceed by Banka or Carimata strait to Sapudi strait; thence through Lombok or Allas strait and south of Timor to the Arafura sea. Steam-ships can, however, continue from Sapudi strait east along the parallel of 8° S. until north of Ombai strait, and between Wetta and Timor, and south of the Serwatti islands to Port Darwin, or through the Arafura sea to Torres straits.

Some authors recommend for steam-ships the route from Carimata strait through Salayar strait, and when the peak of Kambaena bears N.W. to run S.E. by E. for Wetta passage,‡ but this route is not taken by the Eastern and Australian steam-ships.

During the S.E. Monsoon only steam-ships can make the passage from Singapore to Torres straits. The route then taken is from Sapudi strait along the parallel of 8° S. as above. Sailing vessels for the north coast of Australia should cross the China sea and go through Balábac strait, Sulu and Celebes seas and Molucca passage as described on p. 36, to the Moluccas.

NORTH COAST of AUSTRALIA to SINGAPORE.—**In the N.W. Monsoon** steam-ships pass south of the Serwatti islands, through Wetta passage and along the parallel of 8° S. to Sapudi strait; thence through Carimata or Banka strait to Singapore.

Sailing vessels would proceed to the northward through Arafura and Banda seas. Manipa strait and Molucca or Gillolo channels, where they should have the advantage of fine weather, and when to the northward of Gillolo, the wind would probably come from the northward and eastward, which would enable her to proceed round the north end of Borneo, and so with the N.E. monsoon down the China Sea to Singapore.

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* *See* Admiralty charts:—China Sea, southern portion, No. 2,660*a.b.*, scale, m = 0·05 of an inch; Balábac strait, &c., No. 948, scale, m = 0·5 of an inch; Sulu Archipelago, &c., No. 2,576, scale, m = 0·1 of an inch; Celebes Sea, &c., No. 2,575 scale, m = 0·1 of an inch; and China Sea Directory, Vol. II.

† *See* Admiralty charts:—Eastern Archipelago, western portion, No. 941*a.b.*, scale, d = 2·75 inches; eastern portion, No. 942*a.b.*, scale, d = 2·75 inches; Australia, northern portion, No. 2,759*a*, scale, d = 1·0 inch; Australia, north coast to cape Ford, scale, m = 0·06 of an inch; Port Darwin, No. 925, scale, m = 1·5 inches; Port Darwin and adjacent inlets, No. 18, scale, m = 0·5 of an inch; western approaches to Torres straits, No. 447, scale, m = 0·07 of an inch; Australia Directory, Vols. I. and II.; China Sea Directory, Vol. I.

‡ Navigation of the Pacific Ocean, China Sea, &c. United States Hydrographic Office, 1875, Chap. V.

In the S.E. Monsoon steam-ships and sailing vessels pass through the Arafura sea south of Timor, and through Allas and Carimata strait as above.

COMMERCE.—Philippines.—The chief exports of the Philippines are sugar, hemp, coffee, and tobacco. During the year 1889, according to the British consular report, the export of sugar amounted to 220,000 tons, valued at £2,200,000. Of this,—150,000 tons went to the United States, and 49,000 to Great Britain. The export of hemp amounted to 568,571 bales, valued at £3,200,000; of this,—322,000 bales went to Great Britain, and 219,907 to the United States. The export of coffee was about 60,000 tons, valued at £500,000; and of Sappan wood 5,000 tons.

The imports are chiefly cotton goods, petroleum, coal, rice, provisions, &c., valued at £2,925,550 in 1887.*

In 1889 all export duties were abolished, save that on tobacco; on imports there is a general duty of 50 per cent.

The monetary unit for the Philippines currency is the peseta of about 4 reales, equivalent to 8¾*d.*; the dollar consists of 5 pesetas, or 3*s.* 8*d.* The weights and measures of the metric system are in use.

Dutch colonies.—The chief exports are sugar, coffee, rice, indigo, chincona, tobacco, and tin; with the exception of rice, about one-half of which is supplied for Borneo and China, nearly four-fifths of these exports go to the Netherlands. The chief and almost sole article of export to Great Britain is unrefined sugar.

Imports.—Cotton goods, mercers' wares, provisions, and coals.

The entire trade of the Dutch colonies referred to in this work, is carried on with Java, and none of it directly with either Europe, the United States, or Australia.

The monetary unit is the guilder or florin of 1*s.* 8*d.*, the rixdollar consists of 2½ guilders, or 4*s.* 2*d.*

The weights and measures of the metric system are in use. The Dutch ton is 1,000 kilogs. or lbs. 2,205.

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* Consular reports for 1889. The return of imports for the year is as yet incomplete.

CHAPTER II.

WEST COASTS OF LUZON AND MINDORO ISLANDS; MINDORO STRAIT; KALAMIANES ISLANDS; SULU SEA; CUYOS AND KAGAYAN ISLANDS; BASILAN STRAIT.

VARIATION, at Manila, 1° 0′ East,
At Basilan Strait, 2° 0′ East, in 1890.

LUZON.[*]—Luzon is the largest island of the Philippines, and, after Java, the most fertile and populous of the whole Malay Archipelago. It extends from north to south with a curve towards the east, between latitudes 18° 43′ and 12° 10′ north, and has a length of about 420 miles, with a width varying from 30 to 130 miles. It has a very irregular outline, and its area is almost twice as great as that of Ireland. A range of mountains, known as the Caraballos, runs through the whole of it, branching out in different directions so as to give the whole island a mountainous character. To the north of latitude 16° N. there are two chains, an eastern and a western; the former, known as the Sierra Madre, being the most continuous and lofty. The mountains are generally higher near the eastern side, where they form a bold and almost inaccessible shore, exposed to the full force of the north-eastern monsoon, and the waves of the Pacific. None of these ranges are very high, Banajao in latitude 14° 2′ S., which is usually reckoned the highest, being only 6,214 English feet above the level of the sea.

The north coast of Luzon, from cape Bojeador eastward is described in Chapter IX.

WEST COAST.—Cape Bojeador, which forms the north-western extreme of Luzon, is a low point with a reef of breakers projecting from it. To the southward of the cape the coast is cliffy and fringed by a reef, as far as 2 miles south of Dirikwi creek; it then becomes low with a sandy shore as far as mount Kauit, which lies 16 miles south of the cape, the country in the interior being very high. In case of necessity anchorage can be got along this coast during the north-east monsoon.

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[*] *See* Admiralty chart:—Luzon Island, northern part; No. 2454; scale, $m = 0{\cdot}1$ of an inch.

The chain of high mountains inland, which commences near St. Fabian in the gulf of Lingayen, extends parallel to the coast, gradually diminishing in height, and stretching more inland about 24 miles to the southward of cape Bojeador, leaves a spacious plain fronting the sea. Another chain of hills begins about 7 or 8 miles from the shore, and stretches northward parallel to the coast line.

Mount Kauit, on the crest of which are some trees, forms a conspicuous mark on this low coast. The river Laoag disembogues to the southward of the mount; its mouth is closed by a bar forming a bank which extends some distance seaward; the town of Laoag stands near the bank of the river, about 4 miles inland.

The coast from Mount Kauit trends S. by W. for 8 miles to Kulili point, which is high with a sandy shore, and thence continues S. by W. for another 8 miles as far as Solot point, off which is Badog island. Midway between Kulili point and Badog island is Gan bay, with reefs extending 1½ miles to seaward, and immediately north of Gan bay is port Kurrimao, a small circular bay offering anchorage in 4 fathoms, sand. Coasting steamers call at port Kurrimao monthly.

Badog island is low, thickly wooded, and surrounded by a reef. A passage, half a mile wide with 11 to 16 fathoms water in it, separates Badog from the main land off Solot point. The coast intervening between Badog and Salomague island 9 miles to the southward, is rocky, with breakers projecting from it. Anchorage may be found in front of the river Kabugao in 6 to 7 fathoms, sand, between the reefs of the coast.

Shoals.—A shoal, with 1¾ fathoms on it, lies 2½ miles N.E. ½ N. from the north point of Salomague island. Another bank of rock, with 7 and 8 fathoms on it, is situated 2½ miles S.W. by S. of Badog island, and 2½ miles from the shore.

Port Salomague is sheltered from all winds but those that blow between S.W and W.N.W. The north point is encompassed by a reef which stretches along the northern side of the port; and Salomague island, of moderate height, lies about three-quarters of a mile from the point with a reef projecting off it about a cable to the south-west. The south point which separates Lapug bay from port Salomague, is also surrounded by shoals. West from this point, from 1½ to 2 miles distant are rocky banks, with 3½ and 4¼ fathoms on the two nearest, and one fathom on the outer. The port may be known from the offing by a gap in some high mountains, which overtop the rest of the chain on this coast. Salomague gap resembles the gap of Vigan, but is not so large, and does not approach so near the sea as that gap, which may also be seen bearing about S.E. when a vessel is 12 or 13 miles west of Salomague bay. When the gap of Salomague bears about E. ¼ S., an East course will lead direct towards Salomague island at the north point of the port, which should be approached in a large vessel bearing about East; and the reef off its south-west point ought to be passed close in 19 or 22 fathoms, mud, to avoid the rocky banks that lie to the westward of the south point of the port; she may then steer for the middle of the port, rather inclining towards the northern shore, and anchor in 8 fathoms. Farther in there is a shoal spot, which will be perceived in clear weather by the discoloured water on it. The best berth to moor is in 6 or 7 fathoms, mud, opposite some rice magazines on the north shoal. Coast steamers call monthly at port Salomague.

Lapug bay (Salut-Salut bay of the old charts, and Solon-Solon bay of Horsburgh), immediately to the southward of port Salomague, is sheltered from the same winds, but is not so capacious nor so deep. There are 5½ to 7 fathoms, sand, in it until near the shore. In front of the bay are two rocky shoals which will be seen in clear weather. One, with one to 2 fathoms on it, bears W.S.W. 2 miles from the north point of the bay, and has a passage on each side of 9 or 10 fathoms water; but that to the northward, between it and the north point of the bay, is too contracted. The other rocky shoal is in the middle of the entrance to the bay in front of the anchorage, which it shelters somewhat from the sea. The position of the bay will be recognised by mount Bulagao, 3,629 feet high, situated to the south-east.

Pinget island is very low, covered with trees, and situated nearly a mile to the N.W. of a projecting point; it has sandy shores and is surrounded by reefs which are steep-to on the western side A rocky shoal lies south of Pinget island, and a mile from the coast. From abreast of the island the coast is low and sandy to point Dile.

POINT DILE, in lat. 17° 34½′ N., is the most prominent point of this part of the coast, projecting far to the westward. Between it and San Fernando point there are several towns along the coast which should not be approached within a distance of 3 miles; the country is formed of high double mountains, with low woody points to seaward in some places.

Vigan Road is sheltered from northerly winds by Dile point, but exposed to the southward and westward. A patch of 3½ fathoms lies about 1½ miles off shore. The anchorage is in 10 or 12 fathoms, near the shore, with the river bearing about East: the bank shelves suddenly. About 9 miles inland to the E.N.E. of the road there is a chasm between two mountains, named Abra de Vigan, or gap of Vigan, which is very conspicuous when viewed from the offing, and is a good mark to know this part of the coast. The city of Vigan is situated about 2½ miles to the N.E. of the anchorage, on an eminence.

Solvet bay lies 10 miles from Dile point. The eastern shore of the bay is encircled by a reef which extends out a considerable distance. Small vessels can anchor in front of the town sheltered from all except S.W. winds. San Estevan point lies 6½ miles from Solvet bay, and 2½ miles further south is the small port of Santiago, one cable wide.*

Kandon point is cliffy and surrounded by reefs. Vessels can anchor in the bay to the southward. The land in the vicinity is high and extends to the edge of the shore, terminating to the north, at San Estevan point, in a slope ending perpendicularly.

The coast from Kandon point trends south for 19 miles, then for 7 miles S.W. to Darigayos point, which is low, covered with trees, and surrounded by reefs; thence it trends southward again for 13 miles to San Fernando point.

Caution.—During the north-east monsoon a strong current has sometimes been experienced, setting to the N.N.E., along this coast. Vessels proceeding southward should be prepared for this current, or they may find themselves embayed in Lingayen gulf.

Port San Fernando.†—San Fernando point is a small low peninsula surrounded by reefs, and forms with the adjacent coast, two small anchorages; in the southern, there are 6 to 6½ fathoms rocky bottom; the northern is the port of St. Fernando where anchorage can be obtained in 5½ to 7 fathoms, fine sand, but it is exposed to winds from the northward.

The town is situated on the east side of the port on high land, and maintains frequent communication with Manila.

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* **Doubtful bank.**—A bank, not marked on recent Spanish charts, is described as follows in the Derrotero del Archipiélago Filipino, 1879:—Darigayos bank, composed of rocks with 4½ to 1 fathom on it, and extending 2 miles N.E. and S.W., is reported to be situated 3 miles north of San Estevan point; but its exact position has not been defined; some of the local pilots state that it lies further south than the position assigned to it. Caution is therefore necessary when approaching this part of the coast.

† *See* plan on Admiralty chart:—Luzon island, northern portion, No. 2,454.

Supplies.—Game and fish are procurable. Water is obtained from wells.

LIGHTS.—A fixed *red* light, elevated 29 feet above the sea, is exhibited from a lighthouse erected on San Fernando point, south side of the entrance to port San Fernando, and should be visible in clear weather from a distance of 10 miles.

The lighthouse, which is 20 feet high, consists of two iron supports above a small iron building on a base of masonry.

A fixed *red* light, to be elevated 13 feet, and bear S. 74½° E. from the lighthouse on San Fernando point, is to be exhibited near the mole at port San Fernando, and will be visible in clear weather from a distance of 4 miles.

Vessels entering the port, should steer for the anchorage with this light bearing S.S.E. ¾ E., which will lead in the fairway of the entrance.

Fag reef (San Fernando shoal), composed of sand and rock, one cable in extent, with a least depth of 4½ fathoms, lies 2 miles N.W. ½ N. of San Fernando point. From it, the church of San Juan bears E. by N. ¼ N., and the church of San Fernando S.E. by E. ¾ E.

LINGAYEN GULF, is about 30 miles deep, and about 20 miles wide across the entrance, from Santiago island to San Fernando point; on the east coast are the lofty mountains of Ilocos, with the peak of St. Thomas, 7418 feet high; the west coast is of moderate height and tolerably level, gradually rising to the southward to a compact mountain mass. From the island of Santiago, for 12 miles to the S.E., the west coast of the gulf is fringed by an almost continuous chain of islands and islets. The islands are, as a rule, low and wooded, and have shallow channels between them, only used by coasters.

Winds.—The prevailing wind during the greater part of the year is from S.E. During the north-east monsoon, land and sea breezes become regular, and blow freshly, with clear atmosphere, but are interrupted by strong north and north-easterly gales; a bank of cloud seen in the north, with a clear sky and high barometer, is a certain sign of the commencement of a gale. In June, the wind blows from from S.E. in the morning, with squalls off St. Thomas and San Isidro mounts; towards the evening, it dies away with heavy rain and thunder, and clearing towards midnight leaves a light wind from the south, which sets in from the S.E. with the dawn.

From July to October there are usually gales from the S.W. and West, lasting from 3 to 15 days, accompanied by torrents of rain.

The worst period in the gulf is from the middle of September until the end of October, when typhoons occur.

Port St. Thomas is formed by a bank which runs about 2 miles to the southward of the point, and has one to 5 fathoms on it. If intending to proceed to this port, steer to the southward until St. Thomas mount bears nearly N.E., then alter course for it, and as soon as the soundings decrease to 6 and 7 fathoms, turn to the northward for the anchorage. To the north of port St. Thomas the coast of the gulf is high and steep-to.

The coast.—From St. Thomas the coast trends S.S.E. and is high and mountainous as far as St. Fabian, where two rivers disembogue. Thence the coast-line runs W.S.W. for 4 miles to Binlok river, and then 2 miles further to Dagupan or Binmalei river, both arms of the river Agno. The country is low, and fertile, and produces rice, maize, indigo, sugar cane, cotton, and nipa wine.

Dagupan or Binmalei river has 7 to 8 feet on the bar at springs, and a town of the same name situated close to its mouth. Small vessels from the town of Lingayen pass out by this mouth. The town of Lingayen is near the coast, and the tower of its church forms a conspicuous mark on this shore. There is frequent communication between Dagupan and Manila. From Dagupan, the coast trends W.S.W. and then W. by N., forming the head of the gulf.

LIGHT.—A fixed *red* light, elevated 29 feet above the sea, is exhibited on the north-east side of Dagupan harbour entrance, and should be visible in clear weather from a distance of 5 miles.

Port Sual,* situated 2 miles to the southward of the high islet Kabalitian, has good anchorage, muddy bottom, at its entrance; a sailing vessel might be warped into the port, should circumstances render it necessary.

The port is a little over a mile long north and south, and nearly a mile broad, with depths of 4 to 8 fathoms; the entrance, however, is narrowed by rocks and reefs to the breadth of about 2½ cables, while an extensive coral bank, with 6 to 18 feet water over it, fills up a large portion of the port. The eastern edge of this bank is marked by three beacons.

The land about Portuguese point, the northern point of entrance of the port, appears like an island when viewed from a distance of

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* *See* plan on Admiralty chart: Luzon island, northern portion, No. 2454.

7 or 8 miles; the point may be recognized by a small round tower on its bluff, and between it and Kabalitian island the ground is foul with rocks just awash. A reef extends 2 cables from Portuguese point; it is always covered, and the sea breaks upon it only when the wind sets in. There is a beacon near the south edge of this reef. Mangas point, the southern point of entrance, has rocks extending nearly 3 cables from it; but they are always uncovered, and may be approached to half a cable. In the south-west part of the port is the village, which has a church and a small landing jetty. The population in 1880 numbered 3,000.

Adela rock, with 12 feet water, and 6 fathoms close around lies half a mile east of Mangas point. This rock is marked by a beacon.

Tides.—Springs rise 6 feet.

LIGHT.—A fixed *red* light, elevated 79 feet above the sea, visible through an arc of 240° or between the bearings of S. 10½° E. and N. 49½° E., is exhibited from a lighthouse erected on Portuguese point, at the entrance to Port Sual, and should be seen in clear weather from a distance of 10 miles.

The lighthouse, 20 feet high, is constructed of iron, and painted light grey; a watch tower in ruins is near it.

Supplies.—Coals are brought from Lingayen to Sual at 18 dollars the ton. Water can be procured from a stream in south-west part of the port.

Directions.—When approaching the port, keep about 1½ or 2 miles from Kabalitian island, steering for Mangas point; pass the outer rock off that point at the distance of half a cable, and then steer for the church, taking care to avoid the large coral patch, the southern edge of which lies between the north-east point of the port and the church, anchor in 5 or 4½ fathoms.

A British Vice-Consul resides at Sual, and there is frequent communication with Manila.

Kabarruyan island, the south-eastern of the large islands on the west side of the gulf, is 6 miles long N.N.E. and S.S.W., moderately high, and covered with wood. These islands are surrounded by reefs which extend as much as 3 miles from land therefore a berth of at least 4 miles should be given to this coast Between Kabarruyan island and port Sual the coast is intersected by bays with sandy shores, and there are some islands off it.

Port Bolinao* is a narrow channel between cape Bolinao and the low wooded island Santiago. The shore end of the telegraph cable is landed here near a small building situated close to the west shore; it is thence laid in a direction N.E. by E. ½ E. nearly 2 cables to a red buoy moored in 10 fathoms water, thence to seaward in a N. by W. ½ W. direction. Mariners are cautioned not to anchor northward of this buoy when it bears between S.E. and S. ¼ W.; nor westward or southward of the buoy when it bears between East and N.E. ¼ N.†

As the coast of Santiago island and also the islets which lie off it is fronted by shoals projecting about 2½ miles, vessels ought to give the north side of the island a good berth in the north-east monsoon for a southerly current may be liable at times to drift them into Lingayen gulf, or near the shoals on its western side.

Silakwi islet, N.N.W. of Santiago island, appears wedge-shaped when seen from the westward, and to the S.E. of it are several small rocky islets. A reef of coral extends 2 miles round this group.

A shoal with 8 fathoms on it lies 4 miles N.E. of Silakwi islet; and another with 7 fathoms on it lies 6½ miles N.E. by E. ¼ E.

Cape Bolinao is the name given to the north-west extremity of that part of Luzon island which forms the west coast of the Gulf of Lingayen. It is of moderate height, thickly wooded, and may be seen in clear weather about 24 miles; it slopes gently towards the sea, and has Piedra point on its west side.

Piedra point (cape Bolinao of the old charts) is moderately high, steep-to, and sterile in appearance; it is the most western point of cape Bolinao. A semaphore station has been established on the point. From Piedra point, the coast fringes with shoals and reefs, trends N.E. by E. for 7 miles to cape Balinhasay, near which stands the town of Bolinao.

The COAST from Piedra point to Caiman point is level, of moderate height, and sterile aspect, with a steep beach fronting the sea, and may be seen in clear weather about 24 miles. This part of the coast is bold to approach, having no bottom at 50 fathoms within a mile of it in many places; there are soundings near the beach in some of the small bays, where a small vessel might anchor occasionally, but there is no safe place of shelter for large vessels.

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* *See* plan of port Bolinao on Admiralty chart:—Luzon island, northern portion, No. 2,454.

† Were it not for the shoals fronting this channel and stretching nearly a league from the cape all round, shelter would be found inside from all winds; but the approach to it is dangerous, as a vessel may get entangled by the shoals before the entrance of this intricate port is discerned.—*Horsburgh.*

Caiman point has a reef projecting to the S.S.W., but the channel is safe between it and Culebra island. The coast for 30 miles to the southward of this point, as far as point Palauig, is indented with several deep bays filled with shoals, projecting beyond the points that form their respective entrances.

DAZOL BAY, extending between Santa Cruz and Caiman points, has several shoals situated about 1½ miles from the shore The channel between Culebra island and Caiman point leads to Tambove roads, and also to the port of Santa Cruz ; the latter port is only used by coasters, and is approached from the northward between Hermana Major and a small islet 3½ miles east of it. The passage between the two Hermanas, although wide, is reported to be dangerous.

Tambove road.—East of Caiman point is a small bay, and east of this is Tambove road, extending 4 miles east and west, 2½ miles deep, and open only to southerly winds. At the bottom of the bay is Dauli point, and 2 miles south-east of Dauli point is a bank with 6½ feet water over it.

The depth at the entrance of the bay is 18 fathoms, with 13 and 6 fathoms at the anchorage.

After passing between Caiman point and Culebra island, steer to the east, giving a berth to the reefs off the next point ; when the bay is well open steer to the northward for Dauli point, but until in soft mud it will be improper to anchor, for rocks are scattered over the bottom where it consists of sand.

Wood and good water may be obtained here.

Culebra and Hermana islands.—Culebra or Adder island is small, with trees on it, and a sandy beach ; on the south side there is a reef. The passage between the island and Caiman point is 1⅔ miles broad, clear of dangers, and with 60 fathoms water in it. Hermana (Sisters) islands are low and woody, with conspicuous sandy beaches. Hermana Major lies about 5¼ miles southward of Culebra, and is surrounded by reefs. To the north of it is a reef 3 miles long, N.N.W. and S.S.E., with rocks above water, between which and the island there is a channel with 4½ fathoms in it. Hermana Menor (Makalira) lies 3 miles S.S.E. of Hermana Major and W. of Santa Cruz point, with which it forms a channel, having 8 fathoms water in it ; it is about one mile in diameter, with reefs on its west and south sides, and a patch of sand on its north side.

The Coast.—Santa Cruz point is low and covered by mangroves; a reef projects 1⅓ miles from it towards Hermana Menor. Between Santa Cruz point and Arenas point, 6½ miles to the southward, the coast recedes, forming a bay into which three rivers discharge; it then runs south for 4 miles to Bani point. All this part of the coast is fronted by shoals extending 5 miles off shore.

Sabalai bank, 3 miles long north and south, and 2 miles broad, is situated 1½ miles to the north-west of Arenas point; it is a rocky shoal awash at its eastern edge, with from 1½ to 5½ fathoms water over it in other parts. Between Sabalai bank and Arenas point are several pinnacles with 2¾ and 4 fathoms on them.

Tortuga bank, about 2 miles south of Sabalai bank, is 2 miles in extent east and west, with a least depth of 2¾ fathoms.

Ports Masinglok and Matalvi,* situated between Bani point and Makalaba island, are separated by San Salvador island and the reef which extends to the east of it. Bani point is low and sandy, with patches of mangroves on it; a reef projects one mile S.S.W. from it, and nearly joins the shoals awash which form the northern side of the entrance to port Masinglok.

Salvador island is of moderate elevation, thickly wooded, and has reefs extending two-thirds of a mile to the N.W. The channel between Salvador island and the reefs, extending from Bani point, is 4 cables broad, with depths of 27 to 15 fathoms, and a depth of 16 to 14 fathoms is maintained to before the town of Masinglok. The channel south of the island is about 3½ cables broad in its narrowest part; it has a depth of 25 to 15 fathoms in it, and leads to port Matalvi.

Port Masinglok.—The anchorage in front of the town is bad, as it is open to the N.W., and the channel leading to it is narrow and lined with reefs. The space south-east of Salvador island is foul and strewn with rocks, but anchorage can be obtained in a bay on the east side of the island, in 5½ to 6½ fathoms, protected from northerly winds. North of port Masinglok and east of Bani point, is Oyon bay, which runs in 2 miles E.N.E., with depths of 6 to 8 fathoms, mud; the entrance is blocked by a circular reef.

Port Matalvi, which is well protected, is formed between Matalvi island and the coast to the southward; it extends 2 miles east and west, and has a mean breadth of half a mile. The best anchorage is in 8 fathoms, mud, in the middle of the port. Water can be obtained from a spring south of Luan island. Makalaba island, at the entrance of the channel leading to port Matalvi, is circular in form, with a sandy shore on its east side, and reefs which extend two-thirds of a mile from its north and south points.

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* *See* Admiralty plan of Masinglok port, No. 945; scale, *m* = 2·95 inches.

The coast.—From the southern point of Matalvi port the coast trends south to Palauig bay, and is very low, sandy, and bordered by reefs. Palauig bay is 2⅔ miles wide at its mouth, one mile deep, and open to the N.W. The town of Palauig is situated on the south shore.

Palauig point is bordered to the northward by islets, rocks, and shoals, which make this point dangerous to approach.

Palauig reefs consists of various shoals extending 4½ miles off shore between Iba and Palauig points. The southern reef, named Kinabakbagan, with 1½ fathoms water over it, extends 1¼ miles; the northern and largest, with very little water over it, lies off Palauig point. Between these two are several shoal patches; the outer one having only 2½ fathoms on it. It will be prudent to give this part of the coast a berth of 6 or 7 miles.

Iba point, lying 6 miles from Batalan point, is surrounded by a coral reef extending north-west to point Palauig. South-east of Iba point is the town of Iba, capital of the province of Zambales, situated 2½ miles from the mouth of the river of the same name. Anchorage can be obtained south of the 1½-fathom shoal which fronts the mouth of this river.

Batalan or Guai point, 6 miles S.S.E. of Iba point, is surrounded by a reef which extends out 3 cables. Mount Batalan, formed by two hills, the highest of which is 1,847 feet high, dominates the point, and is an excellent mark for this coast. Inland, a double range of high mountains runs nearly north and south, and between these and the coast there is an extensive flat plain named Playa Honda. Of the inner range, mount Pinatubo reaches a height of 6,040 feet.*

Shoals.—At 5½ miles south of Batalan point, and 2 miles from the coast, is a pinnacle rock with 4½ fathoms on it, and at 9 and 11½ miles S. ½ W. of the same point are two other shoals with 9 fathoms over them.

The coast from Batalan point trends about S. by E. for 21 miles to Kabangan bay, and then turns to the S.W. to point Kapones. Barranca Colorada is a very slightly salient point formed by a flat-topped reddish coloured hill situated on the sand. Between Batalan and Barranca Colorada shoal ground extends in places 5 cables from the shore. Between this point and Kapones the coast is bordered by a sand beach, near which there are little plateaux of shoal water, very steep-to.*

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* Horsburgh remarks: "From Manila bay entrance to lat. 15° N. the land is generally high and mountainous: here it begins to decrease in height, and near the sea to lat. 16° N. is not much elevated."

POINT KAPONES, is the most western point of this part of Luzon, and therefore important to vessels proceeding to and from China, and passing close to this coast. It bears North, distant 60 miles, from Cabra, or Goat island, and is high, bare land, of reddish aspect, having three islands to the north-west of it; the largest of these, Great Kapones, lying with its outer point 2¼ miles W.N.W. from point Kapones, is 8 cables long W.N.W. and E.S.E., and has rocks around it; the other two islands, extending 4 cables north and south, lie 7 cables N.E. by E. from Great Kapones, nearly mid-distance between it and the coast.

LIGHT.—On Great Kapones island, at 328 yards N. 59° E. from the western point of the island, there is exhibited a *flashing white* light, showing a *flash* every *thirty seconds;* it is visible through an arc of 306°, or between the bearings of S. 62° W., through east, and N. 64° W.

The light is elevated 228 feet above high water, and should be seen in clear weather from a distance of 23 miles.

The lighthouse, 53 feet high and constructed of brick, is square in shape, and the keeper's dwelling stands at the south-west corner of it.

Soundings.—About a mile outside point Kapones the depth is 42 or 44 fathoms; from 40 to 35 fathoms will be found within a mile of the shore, between this part of the coast and the north point of port Subig, and generally 45 to 50 fathoms about 3 or 4 miles off.

The coast from Kapones point trends S. by E. ½ E. 8 miles to port Silanguin; it is high, rocky, indented by three small bays fronted by islets, and backed by a range of high mountains extending N.E. and S.W.

Port Silanguin is about half a mile wide at its entrance, and 2 miles deep, having tolerable shelter from all winds, except from West and S.W. The southern point is formed by a high, round, bare island, joined to the mainland by a narrow reef of rocks. The depth in the entrance is 18 fathoms, decreasing gradually to the anchorage, a little inside, near the beach on the south shore, which is the best berth.

About a mile S.W. of the south entrance point of port Silanguin are six islets, called Farallon on the chart, adjoining each other, and surrounded by rocks; the outer one lies about one mile S.W. ¼ W.

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* *See* Admiralty chart, St. Bernardino and Mindoro straits with adjacent islands, No. 2,577; scale, $m = 0{\cdot}1$ of an inch.

from point Silanguin. Rocks are reported to extend one to 1½ miles to the westward of these islands.

Water.—There are two streams of fresh water at the head of port Silanguin, and a spring of good drinking water.

The coast between port Silanguin and port Subig is high and moderately steep-to.

Port Subig* has Grande island at its entrance, to the westward of which is the safe passage into the port; for the passage to the eastward is intricate and lined by reefs. This port stretches 7 miles inland, and forms two excellent harbours, one on the east side, named port Olongapó, and the other at the northern extremity, opposite the village of Subig: here vessels may be sheltered from all winds in 7 to 10 fathoms, mud.

The islands in the port are surrounded by reefs, which extend one to two cables; and a rocky shoal, with 2¾ fathoms on it, is situated at the head of the port, 4 cables S.S.W. from point Kabangan. In proceeding to the inner part of the port, steer along the western shore, which is clear of danger.

The extreme of the reef extending off point Kubi, at the entrance to port Olongapó, is marked by two white beacons and a buoy surmounted by a ball. Caiman shoal, within the port, is also marked by a white beacon and a buoy surmounted by a ball. A black beacon marks the part of this shoal which is awash at low water.

There is frequent steam communication between port Subig and Manila.

Port Binanga, or Minangas, is the first bight to the southward of the entrance of port Subig. Small vessels may anchor in 5 fathoms sheltered from all winds, excepting those from West and W.S.W.; the course into it is East and E. by N., about mid-channel between the points, to avoid the shoals projecting from them, and there are 4 fathoms, fine sandy bottom, inside, within a short distance of the shore.

The coast.—From port Binanga the coast trends south for 4 miles and is low, wooded, and bordered by a reef which, north-west of the town of Moron, extends as far as a mile out from the shore. Thence the coast runs S.E. for 4 miles to Napo point, off which there is an islet joined to the point by a reef. From Napo point the coast trends E.S.E. for 4 miles, and then nearly south for 7 miles to Luzon point. thus forming a bight, named Bagak bay, at the head of which is the town of Bagak. The shore of this entire bay is very low. Anchorage may be had off the town of Bagak, near the mole. in 5½ to 11 fathoms.

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* *See* Admiralty chart: Manila bay, No. 976; scale, $m = 0{\cdot}5$ of an inch.

Luzon point is rocky and peaked, of moderate height and bordered by a reef which extends out one cable. The coast from this point trends in a general direction nearly S.E. by E. ½ E. for about 7 miles to Los Cochinos, and is indented with several small bays. Guai bay, the largest of these, affords good anchorage during the north-east monsoon, and is frequented by vessels waiting for a fair wind to enter Manila bay. Reefs extend from the entrance points of the bay; the depth between the reefs is 5½ to 11 fathoms, and 4 fathoms further in, but it is not necessary to enter the bay to be well sheltered.

Los Cochinos, or Lechones, are five low rocks above water which extend half a mile south of the S.W. point of Mariveles port; they are steep-to, with the exception of one rock covered by 5 feet of water, which rock lies one cable S. 9° W. of the easternmost Cochino, Monti islet. Los Cochinos point is the S.S.E. extremity of a little peninsula conspicuous by two hills which command it.

From port Subig to Los Cochinos the coast is in general evenly steep, and may be approached within one or 2 miles in some parts; but it will be prudent to give it a wide berth, as rocks or foul ground extend a considerable distance from some of the points.

MANILA BAY[*] is about 30 miles in extent each way. The land at the entrance is high and covered with vegetation, but the shores at the head of the bay are low, marshy, and intersected by numerous small rivers, estuaries, and tidal lakes. The city of Manila, situated at the mouth of Pasig river (page 58), on the eastern shore of Manila bay, about 25 miles from its entrance, is the capital of Luzon island, and the seat of the Spanish Government in the east. The southern part of the city, surrounded by a wall, and containing the government offices, citadel, hospitals, &c., is separated from the northern and commercial quarter by the river Pasig. There is frequent communication by steamer with Singapore and Hongkong, and a considerable trade with all parts of the world. On the south-east side of the bay is the town and arsenal of Kavite.

The imports of Manila are chiefly British manufactures, linens and cottons, hardware, and articles of British produce; French and German toys and goods, wines, &c. Its exports are sugars, rice, hemp, tobacco, hides, and cotton; a small quantity of coffee, indigo, rhubarb, native cloths and hats.

In the year 1886 the value of the exports was about £3,000,000; of the imports about £3,500,000. The number of vessels entered was 328, of an aggregate tonnage of 316,249 tons, besides steamers and small craft employed in the coasting trade.

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[*] *See* Admiralty chart of Manila bay, No. 976; scale $m = 0{\cdot}5$ of an inch.

The population was 243,886 in 1885, the date of the last census.

Climate.—During the months of June, July, and August, the air of Manila is rendered impure by noxious exalations arising from the swampy land around ; and the weather being sultry, with much rain at times, febrile complaints are then likely to appear. Care should be taken to avoid exposure to the sun. There is a good native hospital (attended daily by an English doctor) to which sick merchant seamen are sent.

Quarantine regulations are very strict, and often entail great inconvenience on vessels arriving.

Telegraph.—A telegraph cable connects Manila and Hongkong.

Winds.—The north-east monsoon blows strong out of Manila bay at times, accompanied by a cloud resembling smoke, which is driven out of the bay to the S.W., and forms an arch in that horizon, when the sky is otherwise clear ; but sometimes sea-breezes from the S.W. blow into the bay in the north-east monsoon after mid-day, increasing in strength as you advance into the bay.

During the strength of the north-east monsoon, although the wind may be fresh at the entrance, it will frequently be moderate within the bay.

At the season of the south-west monsoon, storms, known as "collas," blow from S.W. to west and are accompanied by violent squalls and much rain ; they often last 6, 8, or 10 days.

Land winds, during the north-east monsoon, blow from east in the bay, and from S.E. on the south coast north of point Fuego, they commence about 4 or 5 p.m., fall towards midnight, then set in again from north, changing to N.E. during the day, and east towards the evening. When hard north and south-west winds are prevalent there are generally no land winds.

Typhoons frequently occur, and are generally most severely felt in the months of October and November.* Notice of this approach is given from the observatory of the Jesuits at Manila, which is in telegraphic communication with observatory at the north point of Luzon.

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* A typhoon of great violence passed over Manila on Oct. 21, 1882. The Surveyor to Lloyd's Register reported as follows :—Many of the houses of the Europeans have been completely gutted, all the furniture being blown away. All the native houses are blown down and many public buildings. The anemometers at the observatory registered a velocity of 144 statute miles per hour, but the wind increasing they were all swept away, consequently the maximum velocity is not known. The barometer in my office went down to 28·52. The vortex of the storm, presenting the usual characteristics of violent light and frequent electrical discharges, passed over Manila rather to the northward at 11.45, and after a few minutes calm the wind struck us from the opposite quarter. Either this storm must have been of small diameter or its movements of translation very rapid, since the vortex reached us in about three hours from its commencing to blow hard, and in three hours more the violence of the wind was abated. The consequences to the shipping have been disastrous. Altogether, 12 ships are aground near Malate.

Manila is also visited somewhat frequently by violent earthquakes.

Storm Signals.—The following storm signals are shown from a signal staff at the Harbour office, on the bank of Pasig river; also from a signal staff, situated near the Cathedral, and visible from the roadstead, Manila bay :—

These warnings are based upon information collected at the Observatory at Ermita :—

(1.) A *drum* will indicate a storm at a great distance, in an unknown direction. As the storm approaches the signal will be changed.

(2.) A *cone, point upwards*, will indicate that a cyclone will pass some distance to the northward, and that strong winds between south and west are probable.

(3.) A *cone, point downwards*, will indicate that a cyclone will pass some distance to the southward, and that strong winds between south and east are probable.

(4.) A *cone, point upwards over a drum*, will indicate that a cyclone will pass close to the northward, and that heavy gales from south, through west to north, or from north, through west, to south are probable.

(5.) A *cone, point upwards under a drum*, will indicate that a cyclone will pass close to the southward, and that heavy gales from south, through east to north, or from north, through east, to south are probable.

(6.) A *ball* will indicate that a typhoon is approaching; and that both the entrance of vessels into the river, and all boat traffic, are prohibited.

The signal staffs are painted white.

Supplies.—The quantity of coal for steaming purposes, kept in stock, varies considerably, but it can always be obtained, and is taken on board from lighters in the bay. In 1887, the price for Cardiff coal, placed on board, was about 10 dollars per ton.

Water can be purchased, and is brought alongside in steam water tanks. The water in Manila, excepting the rain preserved in tanks, is brackish and very hard.

Fresh beef is very bad, it being spoiled in the killing. If much be required, the bullocks should be purchased, and killed on board.

The price is about 10 cents per lb. Vegetables are very moderate in price, but not plentiful.

Corregidor or Mariveles, and Caballo are two islands dividing the entrance of Manila bay into two channels, known respectively as the North and South channels. Corregidor, the principal island, 639 feet high, lies near the north shore, and is 3¼ miles in length East and West. On its north side is a small bay protected by breakwaters affording good anchorage for coasting vessels; and from Buri point, a reef extends to the southward towards Caballo island.

There is fresh water to be procured under a steep cliff at the western end of this island, but the landing is on a stony beach, and inconvenient.

Caballo island is a high bluff rock 420 feet high, of considerable size, partially covered with verdure, lying about three-quarters of a mile southward of Buri point, the eastern extreme of Corregidor. A reef and shoal water extend about 5 cables from its western extreme.

The channel between the two islands is about 4 cables wide and has a depth of 7¼ fathoms in the middle ; the tides in it are strong.

LIGHTS.—On the summit of Corregidor stands a lighthouse 60 feet high, from which is exhibited, at an elevation of 639 feet above the sea, a white light, *revolving once every ten to twenty seconds*, and visible in clear weather from a distance of 20 miles. A *fixed white* light is shown from the white tower on the West Mole head, at the entrance to the bay on the north side of the island.

A *fixed* white light is exhibited from low spur on the north-east part of Caballo island, 27 feet above high water mark, and is visible 6 miles. This light is concealed by high land to seaward between the bearings of N.N.E. and E. by N., and screened towards the north shore between the bearings of S. by W. and E.S.E.

A *fixed* white light, showing a sector of *green* light through an arc of 75°, or between the bearings of N. 47° E. and N. 28° W., is exhibited from a lighthouse on Sangley point, the outer extreme of the low land at the entrance of port Kavite. It is elevated 29 feet above high water, and is visible in clear weather from a distance of 6 miles. The light is shifted as the point extends.

A *fixed red* light, elevated 51 feet above the level of the sea, is exhibited from a white circular tower, on the northern mole at the entrance of Pasig river, and should be visible in clear weather from a distance of 9 miles.

A *fixed green* light is exhibited from an iron stand painted red, on the battery of the southern mole, entrance of Pasig river. This light is elevated 16 feet above high water, and should be seen from off the entrance of the river, between the bearing of N.W. and S.E., at a distance of one mile; it bears South from the red light on the north mole.

Soundings of 50 to 40 fathoms will be obtained when within 7 or 6 miles of Corregidor, decreasing gradually to 27 or 26 fathoms about 2 miles to the westward of it.

Between Corregidor and the north shore the depths are 50 to 48 fathoms within a quarter of a mile of the island, 26 fathoms in mid-channel, decreasing quickly to 16 or 15 fathoms, stony ground, within half a mile of the north shore.

La Monja, the Nun, or Haycock, is a high rock, bearing from Corregidor light W. ¾ S. distant 3 miles, with 27 fathoms water within a quarter of a mile of it all round. The soundings from it decrease regularly to 20 fathoms within a quarter of a mile of the north shore, and deepen to 29 or 30 fathoms near the north-west part of Corregidor, close which there are two rocks one of which is perforated.

El Fraile, the Friar, rock or islet, which appears like a sail, lies 3¾ miles S. ½ E. from Caballo light, and nearly 2 miles from the south shore of the bay. Close around it are depths of 10 and 11 fathoms, increasing to 17 and 23 fathoms at a short distance to the westward.

Port Mariveles, on the north side of the entrance to Manila bay, is about a mile wide and 1½ miles deep; with good anchorage, sheltered from all but S.E. winds. Vessels of any size may moor here, and procure excellent water. Some rocky islets, Los Cochinos, with a rock awash just outside them, project half a mile off the south-west point of entrance. Vessels may anchor in 17 fathoms, with the village bearing N.W. by W., or they may run farther into the bay if necessary; the bottom being good holding ground, and the anchorage safe. This is a convenient place for vessels to touch at when in want of wood and water, the former being an expensive article at Manila.*

From port Mariveles, the coast trends east to point Lasisi then north-east to point Limai; between the two latter points the shore is fronted by foul ground, and between San José and Real points, fishing stakes extend 2 miles from the land.

Shoal.—A shoal of 12 feet water, on which the American ship

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* *See* Admiralty plan of Mariveles, on chart of Manila bay, No. 976.

Sea Witch grounded in 1884, is reported to lie with Kaukauve point bearing West, distant 6 cables.

Limbones and Karabao islets are two rocky islets on the south side of the entrance; between them is Patungan cove which runs in 2 miles to the S.S.E. From Limbones islet, the coast is high and cliffy as far as Marigondon river which forms the boundary of the high lands of the Sierra de Pico de Loro.

A semaphore station has been established on point Restinga, one mile East of Karabao island.

St. Nicholas Banks are two shoals lying midway between Caballo island and port Kavite. The outer shoal, nearly a mile in extent, is the larger of the two, and has but 5 feet water on its shoalest part. From its outer or northern edge in 11 feet water, Corregidor light bears W. by S. ¾ S., and Kavite church E. by N. ½ N. Within a ship's length to the north-westward there are 13 and 15 fathoms water, the soundings being no guide in approaching it, because the bank is so steep. La Monja island in line with the north-west point of Corregidor island, bearing W. by S. ¾ S., leads north of the St. Nicholas banks.

Kavite, on the eastern shore of Manila bay, is the port and marine arsenal of Manila, where vessels are built and repaired, it having excellent conveniences for that purpose. There is a slip, with a cradle 270 feet long, 36 feet broad, and hydraulic power capable of drawing 2,000 tons; also workshops containing appliances of all kinds for repairs. A dock for gunboats and a larger private dock for vessels of 1,500 tons are in course of construction. The town is well fortified, and stands on a low point of land, which forms a good harbour or cove, the deepest water in which appears to be* 3¼ fathoms, soft mud, with shelter from West and S.W. winds. As the water in the wells here is brackish, the inhabitants are supplied with fresh water from the river by Old Kavite.

Sangley point, north of the town of Kavite, is reported to be extending at the rate of about 50 feet per annum.

The course from Kavite to Manila is N.N.E. 7 miles, and from the former the depths increase regularly to 7 or 8 fathoms about midway, then gradually decrease to 4½, 4, and 3¾ fathoms off Manila. With a turning wind between them, a ship may approach the shore to 5 or 4½ fathoms, the bank fronting it being very flat, and composed of soft mud.

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* *See* Admiralty plan of port Kavite, No. 975. This port by the chart must have filled up since Horsburgh's time, for he says there are 6 or 7 fathoms in it.

Communication between Kavite and Manila is carried on by means of small steamers, but is interrupted during bad weather. The distance by road is 15 miles.

Anchorage in Manila Road.—Anchorage may be had in all parts of the road, and the bearing of the lighthouse on the end of the mole on the northern side of the entrance of the Pasig river, with the soundings, are sufficient guides to taking up a berth, but the lighthouse should not be brought to bear south of east.

The best berths and most convenient are with the lighthouse bearing from N.E. by N. to N.E. by E., and the cathedral about E.N.E. in the depth of water preferred, from 3½ to 6½ fathoms. During the N.E. monsoon vessels can anchor closer in to the mouth of the river, but in the S.W. monsoon it is better to anchor further out, as the strong winds from that quarter raise a sea in the bottom of the bay. In the position given above the current out of the river assists loaded boats to fetch off under canvas against the fresh afternoon breezes, when a very unpleasant sea prevails, which not only renders pulling in laden boats laborious, but entails wetting, with perhaps damage to cargo.

Pasig River.—The entrance to this river lies between two moles extending in a W. by N. direction from its north and south points; there is a depth of 11 feet on the bar at low water, and 25 feet within the harbour. The channel leading over the bar lies in a direction between South and S. by W., passing near the head of the south mole; and is marked by four red buoys, three on the western side and one on the eastern. Near the extremity of the south mole is a portion of the breakwater, which is to form the new harbour, extending in a direction S. by W. Stakes have been driven in to mark its direction. Pasig river is the principal channel of communication with the interior. It passes between the commercial districts and the fortress of Manila, and is navigable for about 10 miles; its average breadth is about 350 feet, with depths from 3 to 25 feet.

Tugs.—Tugs are obtainable for towing vessels into the river.

Tides.—It is high water, full and change, in Manila bay, at 10h. 40m.; springs rise about 6 feet. The time of high water is variable; in the appendix tables are given for finding the time of high water at Corregidor and Kavite. The tides are complicated; with an easterly wind, the ebb runs out 18 hours together, between Corregidor and the north shore, pretty strong; the flood about 6 hours to the eastward, sometimes weak, at other times with considerable strength.

The greatest range of tide occurs generally in June and December and is about 6 feet; the smallest range of tide is about 3½ feet, generally in March and September. The diurnal inequality of height is at a minimum, that is, the two tides of the day are equal when the moon's declination is nil, and it is greatest when the moon's declination attains its greatest value either north or south, when single day tides occur.

The highest tide occurs about two days after the moon's greatest declination, and neaps about two days after the moon passes the equator.

The time of high water is variable.

The range of spring tides varies with the seasons, being at a maximum about the solstices, and at a minimum about the equinoxes. The difference of range is about 2 feet. The age of the spring tide varies with the seasons. At the solstices it is nil, or the highest tide occurs on the day of full and new moon. It then assumes a minus quantity, increasing in amount until, at the equinoxes, the highest tide occurs at the moon's quarters, and continues to move backwards until, at the next solstice, it is again coincident with the full and new moon.

It thus appears that the movement of the tide is almost wholly formed by the declination of the moon.

The mean tide level varies during the year about 7 inches, it is lowest in February and highest in August.

Time Signal.—A time signal is in operation at the Meteorological Office (a tower with a flat roof, on the sea wall of the fort) :—The signal is a black ball which is hoisted to the top of the staff at 5 minutes before noon, and dropped at noon, local mean time—equivalent to 15h. 56m. 8s. Greenwich mean time ; a gun is fired at the same instant. Its accuracy is not to be depended on.

Directions.*—If intending to enter Manila bay by the North channel,—when about 6 miles to the westward of Corregidor island, steer for it ; with a fair wind the common passage is between this island and the Haycock, afterwards on the north side of Corregidor. From hence to Manila the course is N.E. by E. ¾ E., distant 25 miles, and to Kavite E. by N. ¾ N., 22 miles. To avoid San Nicholas banks, keep the Haycock open to the northern part of Corregidor bearing W.S.W. until the steeple of Kavite church bears East, and a remarkable hummock, which stands close to the sea upon a point of land on the north shore, W.N.W.; being then clear of the shoals, steer for Kavite or Manila at discretion.

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* Principally from Horsburgh.

In the fair channel, between the shoals and the north shore of the bay, the depths are 17 and 18 fathoms, decreasing gradually towards that shore to 5 and 4 fathoms; and in steering eastward, the depths also decrease regularly to 5 fathoms off Kavite, where ships anchor a little more than a mile off shore in that depth, the bottom all stiff mud.

In using the channel northward of Corregidor, care must be taken not to near the north shore under a mile, in order to avoid the dangers fronting that part of the coast. It appears from the chart that the Haycock kept to the westward of S.W. ¼ W., will lead clear of these dangers.

South channel.—When the wind is blowing from the eastward, out of the bay, the current runs out through the North channel to the westward; it is therefore advisable at such times to adopt the channel between Corregidor and the south shore, there being more room in it to work to windward, and no hidden danger. To enter the bay by this channel, caution is requisite when the vessel is abreast the easternmost high land on the south shore, which bears S.E. ½ E. from Corregidor; for the edge of the St. Nicholas banks trends gradually towards this high land and the water may shoal suddenly in approaching them from 12 to 7 or 6 fathoms, rocky ground. Do not, therefore, come under 12 or 13 fathoms, nor under 15 or 16 fathoms when rather to the eastward, and keep the Haycock then open with the northern part of Corregidor. From 15 fathoms water, the next cast may be 7, and then 4 fathoms on the verge of the St. Nicholas banks, when the Haycock is shut in with Corregidor.

To avoid the St. Nicholas banks at night, Corregidor light must not be brought to the westward of S.W. by W. ¾ W.

Within three-quarters or half a mile of the eastern part of Corregidor there are 22 and 23 fathoms; and when it can be rounded, stand over for and work along the north shore, taking care not to stand in too near the coast in the vicinity of Kaukauve point; when past Limai point, the north shore has good anchorage over a sandy bottom. Farther to the northward and eastward this shore becomes more flat, the soundings decreasing regularly from 10 to 8, 6, 5, 4, and 3 fathoms close in shore.

Sir Edward Belcher remarks, that it is customary to enter this bay by the passage between Mariveles bay and Corregidor island, but experience has proved that this practice is injudicious, that the wider channel easterly, where less tide prevails, is to be preferred, where the local or coasting pilot well knows, that by hugging the eastern coast of the bay or wide channel, a fair leading or working breeze will be experienced at times when calms prevail on the western side of the bay. As an instance of this, at 5h. 30m. a.m. on the 16th March 1844, an American frigate was seen at dawn well to windward, taking the western channel. Fresh working breezes prevailed, and at noon *Samarang* having beat up by the eastern channel, had brought El Fraile S.S.W. ½ W. and Kavite lighthouse E.N.E. In 12 hours, viz., at 5h. 30m. p.m. she was moored off Manila. At dawn the next morning the American frigate was seen becalmed on the west side of the bay, and she did not anchor off Manila before 8 o'clock.

Working up on the eastern side of Manila bay, the chart furnishes sufficient warning as to where danger may be apprehended. The best leading marks for avoiding the San Nicolas banks (until Kavite lighthouse bears E. by N. ½ N.) is not to open El Fraile to the westward of the more distant land to the southward. Nevertheless, it is prudent to hug that shore, on short boards, up to that limit, particularly about noon, or before 2 p.m., as the south-east sea breeze first makes easterly, then southerly, off Kavite, which affords a fine lead to the anchorage off Manila.

SOUTH-WEST COAST of LUZON.—Although this coast is out of the ordinary track of vessels passing up and down the China sea, yet it is of importance when proceeding to or from Manila, inside the Lubang islands. Vessels navigating along it should keep near the shore, in order to escape the tides which run from the entrance of Manila bay to the south-westward.

From Limbones island the coast trends S. by W. about 7 miles to point Fuego, and is intersected by various bays. It is elevated, rocky, and very steep-to, with several islets in its vicinity.

Port Jamilo, situated about 4½ miles to the southward of Limbones island, is on the south-east side of the bay of the same name, and runs in about 1⅓ miles to the eastward; the entrance is about 4 to 5 cables in breadth, with depths of 16 and 14 fathoms, decreasing gradually towards the interior, where the soundings are 5½ to 6½ fathoms, sand and mud.

The best anchorage is on the north side in 6½ and 7½ fathoms. Mangroves grow near the mouth of the river which discharges at the head of the port, the shore of which is low.

Soundings.—The soundings off this part of Luzon are deep and irregular, 30 to 110 fathoms, and afford but little or no warning when approaching the dangers, close to which are 17 to 60 fathoms; consequently the navigator will have to approach the coast with proper care and caution.

The coast.—Point Fuego is moderately high and rocky, with an islet off its north side. Two other islets, connected by a reef, lie 1⅓ miles S.S.E. of the point, and have a pinnacle rock, awash at low water, on their eastern side.

Nasugbu bay, about 5 miles to the south-westward of Fuego point, is formed by low land with a dark sandy shore, which is steep-to and wooded. About the middle of this bay the river Lian discharges; on the bar is a depth of 2 feet at low water. The town of Nasugbu, containing 3,600 inhabitants, is situated on the right bank of the river. Anchorage during the north-east monsoon can be obtained in front of the bar of the river Lian, in 5½ to 7½ fathoms, sand.

Shoal.—A rocky shoal, one cable long east and west, and a quarter of a cable broad, with 4½ feet water over it at the eastern extremity, lies 4 cables from Nasugbu point; from the shoalest part, Fortune island bears W. ¼ N., point Talin S. ½ W., and point Fuego N.N.W. ¾ W.

Talin bay, lying to the north of Talin point, is 3⅔ miles wide, and about 1⅓ miles deep, but open to the N.W., and foul. Its shore is composed of alternate rocky cliffs and sandy beaches.

Talin point is of moderate height, of rocks and short sand beaches which serve as a base to several pyramidal hills very slightly wooded; it is surrounded by a reef to the distance of one cable.

The coast.—Two miles to the south of point Talin is a little bay (Matabukai); from here the coast trends south for 8 miles to point Kalatayan, and is very low, with sandy shores and mangroves; it is also intersected by several estuaries and is fronted by a reef which extends 2 miles to seaward. Soundings of 14 and 17 fathoms will be obtained half a mile from the edge of the reef.

Cape Santiago.—The south-west extremity of Luzon island is moderately high, wooded, and surrounded by a reef which extends about a cable from the shore, and dries. The soundings at the edge of the reef are 4 to 5 fathoms, deepening abruptly to 44 and 55 fathoms at a distance of half a mile.

Light.—There is a semaphore station on cape Santiago, in connection with Manila, and a lighthouse will shortly be commenced.

Minerva rock.—Vessels passing eastward of the Lubang group and approaching cape Santiago or St. Jago, the south-west point of Luzon, should be careful to avoid the Minerva rock, which seems not to have been noticed by navigators, until the *Minerva*, of Alloa, Captain Robertson, bound from Sydney to Manila, struck on it at 2 a.m., September 10th, 1834, although an American ship had been wrecked on it several years previously. It is said to be a coral rock, having 17 fathoms water near it, and bearing from cape Santiago S.E. ½ E. distant 4 or 5 miles.*

The CHANNEL eastward of the LUBANG ISLANDS, and also between them and Mindoro, is frequented by the Spanish vessels when going to or coming from Manila. The *Samarang* worked through this channel easterly, and Sir Edward Belcher remarks :—"It is important to remind seamen that from about 4 to 6 a.m. those who frequent this coast state that sudden heavy squalls may be expected off-shore, and as vessels are compelled to carry a press of sail to make progress, they should shorten before they round Kalavite ; and this especially applies to close working to get through the channel between it and Lubang. Even with caution a flurry took two jib-booms in succession between 6 and 10 a.m. The advantage gained by this channel, which is free from danger as to pilotage, was manifest, as it enabled us, having cleared the channel at 3 p.m., to reach the entrance of Manila bay with a free wind at 10 p.m."

Fortune island, situated 6½ miles S.W. of point Fuego, is about a mile in extent, bare and steep-to, with some rocks off its south-eastern side. Sir E. Belcher observes :—"The island is safe to, and like Cabra, requires but the seaman's attention."

Simo banks, about 14 or 15 miles northward of the Lubang group, consist of two banks with a least depth of 8 fathoms on them. The western bank extends 2 miles north and south and lies 12 miles W. ½ N. from Fortune island. The eastern bank extends N.E. and S.W., and bears W. by N. 8 miles from Fortune island. There are irregular soundings, 21 to 109 fathoms near these banks.

LUBANG ISLANDS are a detached group of six islands that front the south-west end of Luzon and the north-west end of Mindoro. They are uninhabited with the exception of Lubang island, which in 1879 had a population of about 3,000. The only safe anchorage for vessels during all seasons is the port of Tilig, situated on the north-east coast of Lubang island.

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* Horsburg, Vol. II., 8th edition, p. 448. This rock was unsuccessfully searched for by the Spanish Hydrographic Commission under Captain D. Claudio Montero, and has been erased from the Spanish charts.

Cabra or Goat island, the outer or westernmost island of the Lubang group, extends 2 miles from N.W. to S.E., and is a low, flat,* wooded island, with a reef projecting half a cable from its north and north-east sides.

Sir E. Belcher remarks :—"Some doubt existing as to the true position of the dangers reported to extend off this island, a day was devoted to establish this turning point of the navigation of these seas."

The *Samarang* grazed the island on its eastern side, rounding to and anchoring off its southern face. The distance usually observed in passing land is the only question to be noticed here. No dangers requiring express caution exist. It has also been passed by the *Samarang*, very close on the west side, much within the range that any merchant vessel could try, without the appearance of danger. In the voyage of H.M.S. *Sulphur* it is observed :—"Both the *Starling* and *Sulphur* shaved the surf-line of Cabra without obtaining soundings; therefore, the dangers reported to lie to the northward of this island are incorrectly stated.

The channel between this island and Lubang is about 1½ miles broad, and may be navigated without fear, as the reefs on the north side of Lubang always show. In this channel the flood sets to the north and the ebb to the south.

LIGHT.—Near the western extreme of Cabra island is exhibited a *group flashing* white light *every minute*, the duration of each flash being *eight seconds*, the interval between each two flashes of the same group *seven seconds*, and the interval between the groups *thirty-seven seconds*; it is visible seaward through an are of 268°, or from the bearing of S. 49° W. to N. 39° W.

The light is elevated 217 feet above the sea, and should be seen in clear weather from a distance of about 22 miles.

The lighthouse, 67 feet high and constructed of brick, is square in shape with sloping base, and keeper's dwelling attached on its eastern side.

Lubang island, extending about 16 miles nearly N.W. and S.E., is the largest and most important island of the group; it is high in the middle, but low at each extreme.†

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* Mr. J. Phillips observes that Cabra is of moderate height, about 200 feet, and very even.

† Mr. J. Phillips, Master, H.M.S. *Viligant*, 1863, remarks that the northern part of Lubang is very low land, and when coming from the southward, the northern extreme of the high land in the centre may be mistaken for the end of the island.

Its coasts are protected by a reef which extends about a quarter of a mile from the shore; the south-west coast is rocky. On the eastern and north-eastern sides are several bays, more or less protected, but difficult to make, owing to the shoals and reefs by which they are enclosed.

Port Tilig, on the north-east coast of Lubang, is the only safe anchorage for vessels in all seasons; it is sheltered from all winds and completely protected from the sea. The holding ground is excellent. The entrance faces the N.N.W., and is beaconed by the reefs on which the sea breaks during rough weather. In the entrance there are depths of 14 to 5½ fathoms at low water, in mid-channel, and the western shore can be approached until the anchorage, in front of the bastion, is reached in 5½ to 3¾ fathoms, mud and sand. The bottom of the bay is occupied by a shoal in the shape of a half moon, shewing at low water, which divides the port into two distinct anchorages.

The San Vicente bastion is situated on the western point of the entrance; it is a square tower of rough stone, upon the parapet of which a wooden house has been erected.

Ingress and egress, unless in very favourable weather, owing to its being on a lee shore, is questionable for a sailing vessel.

Cattle, pigs, and poultry can be obtained at moderate prices, also a fair supply of water. There are no vegetables, and fruit is very scarce.

Tides.—The tides are complicated; it is high water, full and change, in port Tilig at 9h. 30m.; springs rise 5 feet.

Luk bay,* on the east side of Lubang, is thus described by Sir E. Belcher:—"On the eastern end of Lubang island, and covered by Ambil island, is the very snug port of Luk, which affords safe retreat in the event of accident in passing Kalavite, or during the navigation of Verde island passage. It is pretty free from dangers at the mouth, and good holding-ground will be found in depths between 10 and 20 fathoms. Within the former depth it suddenly shoals, and several lines of coral ledge bar the inner depths of the bay from direct access, although excellent shelter would be found by a vessel moored between these barriers, to which they might easily be conducted. At the village a brisk rivulet supplies most excellent water, but boats cannot fill except at high water."

In approaching the bay caution must be observed, as a 3½-fathoms patch is marked on the chart about 2½ miles to the eastward of the southern horn of the bay. Water, as well as wood, are easily procured, but bullocks, stock, vegetables, &c., are at the same (or higher) prices as Manila.

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* *See* Admiralty plan of Luk bay, on sheet, Ports in the Philippine islands No. 972.

From Luk bay, the coast trends to the N.W., about 7 miles to port Tilig, and is generally fringed with reefs; there are some small bays on this coast, but they only afford protection amongst the reefs for small vessels with local knowledge.

Ambil, or Amul, island, lying to the east of Lubang, is about 4½ miles east and west, and is formed by a conical mountain, about 2,500 feet high, with a plain on its western side. The N.E. coast is high and rocky, with an open bay, in which are depths of 10 to 11 fathoms; on the west side is a bay half a mile broad, in which anchorage can be obtained in 4 fathoms, mud; a reef extends 2 cables from the shores of this bay.

The passage between Ambil and Lubang, is clear, but caution is necessary on account of the reefs, which contract the channel to one half its apparent breadth. The flood tide sets to the south, and the ebb to the north, through this channel.

Afuera bank, to the north of Lubang island, and 2½ miles from port Tilig, extends 1½ miles from East to West, and is three quarters of a mile broad, with depths of 2 to 4 fathoms over it. From the bastion of Tilig, the shoalest part bears between N. ¾ W. and N. by W. ½ W.

Ambil bank, a crescent-shaped shoal, is 2 miles in extent with depths of 4 to 5½ fathoms on it, and a patch of rock in the centre with 2 fathoms water over it. It lies N.W. of Ambil island and close to it; the channel between the edge of the bank and the N.W. point of the island being 4 cables broad.

Malavatuan island, 3 miles to the north of Ambil, is about 3 cables in extent N.E. and S.W., and covered with brushwood. It is steep-to, and has a passage 1½ miles broad between it and Mandani, island, with depths in it of 5½ to 7 fathoms. To the north and north-westward of this island are shoal patches on which the least water appears to be 6 fathoms, the soundings round about being 36 to 50 and 90 fathoms.

Mandani island, one mile north of Ambil, is rather more than half a mile in extent, and composed of two small hills of unequal height. On the S.W. side is a shoal a cable from the shore, the other sides are steep-to.

Golo island, a high but long narrow strip of land, 8 miles W.N.W. and E.S.E., with reefs off its north-east, east, and south-east points, adjoins the south-eastern extreme of Lubang. The south side of Golo island must be approached with caution; coral reefs extend about one cable from the shore. H.M.S. *Teazer*, 1872, anchored in 13 fathoms, mud, off this part of the island, with cape Kalavite bearing S. ¾ W., and the S.E. extreme of Golo island S.E. by E. ¾ E. About a quarter of a cable nearer the shore 4 and 5 fathoms, coral, were obtained.

The channel between this island and Lubang is 4 cables broad with a rock nearly awash in its centre. The flood tide runs to the south, and the ebb to the north through this channel.

Flying Cloud rock.[*]—The ship *Flying Cloud*, on the 7th April 1854, is reported to have struck on a sunken rock, with 6 to 12 feet water on it, and about 30 or 35 feet in diameter; it is said to lie in lat. 13° 28′ N., long. 119° 34′ E. (approximate).

The WEST COAST of MINDORO ISLAND has no soundings off it excepting in the bays, or within one or 2 miles of the shore in some places. In the interior double and treble chains of mountains extend through the island, and some low points of land project from them into the sea.

Cape Kalavite, the north-western extreme of Mindoro, is in lat. 13° 26′ N., long. 120° 18′ E. Between it and Paluan bay there are soundings near the shore, which is bold to approach; for the few rocks interspersed along this part of the coast, adjacent to the cape, lie close in, and one of them, just above the water, has a sandy beach adjoining, upon the projecting part of the coast that forms the cape. Over this point stands mount Kalavite, which is of regular sloping form, and visible at a great distance in clear weather.[†]

Paluan bay[‡] affords excellent shelter in the north-east monsoon, and is also a convenient place for vessels to obtain supplies when passing through Mindoro strait. The bay is 5 miles wide at entrance, of a semi-circular form, running back 3 miles in a northerly direction. There are no dangers in it. Reefs, dry at low water, extend a quarter of a mile from either point of entrance, having deep water close to them. The soundings at the entrance are from 45 to 50 fathoms, half a mile to the southward of which they increase to 200 fathoms.

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[*] Flying Cloud rock was unsuccessfully searched for by H.M.S. *Serpent*, 1865.

[†] Wilkes, says: "Our observations made Kalavite Peak 2,000 ft. high. This peak is of the shape of a dome, and appears remarkably regular when seen from its western side. U.S. Exploring Expedition, Vol. V."

[‡] The description of this bay is by the late Captain W. T. Bate, R.N., of H.M.S. *Royalist*. *See* Admiralty plan, Ports in the Philippine Islands, No. 972, *m* = 3 inches

The best anchorage is in the north-eastern extremity of the bay in 14 fathoms (to which the water suddenly shoals from 20 fathoms), less than a mile from the beach, and West from a small isolated head, upon which a hut is erected. There is a black rock close to it, standing a few yards in front of a sandy beach, which shows in good relief The bottom consists of a black tenacious mud, from which it is difficult to extricate the anchor after it has been down a few days.

Water.—A small river disembogues immediately on the north side of the cliff, where good water can be obtained with facility; and on the beach there is plenty of drift-wood. The coral projects half a mile from the entrance of the river, and has 10 and 12 fathoms close to its edge.

Caution.—Care must be taken when working into Paluan bay, for the squalls come violently off the high land, are very sudden, and at night do not give the least warning.

Tubile point has on its southern side two islets, which as well as the point, are very steep-to, with 32 and 40 fathoms outside them, and very close to them. From the point the coast trends eastwards, forming a bay full of rocks.

Mamburao reef extends about 3 miles to the southward, and has a depth of one fathom over it at low water. Anchorage can be obtained opposite the mouth of the Mamburao river, to the westward of the reef, in 4½ fathoms, mud and sand, with shelter from north and east winds.

The Coast from Mamburao reef trends south-eastward to Talabasi point, and is low with sandy shores. From this point, which is surrounded by a rocky shore, the coast continues to the south-east to Sablayan point.

The two islands of Pandan are situated to the north of Sablayan point; protection may be obtained, during the south-west monsoon, by anchoring close to the eastward of the southern island, in 7 to 14 fathoms, mud. In order to reach this anchorage, pass to the northward, or between the islands.

Sablayan Anchorage* has a total width of 8 cables between Sablayan point and the coast to the eastward; but the available space is reduced one-half by reefs on both sides, and the northern part is filled by a reef enclosing a lagoon 4 to 5 fathoms deep, to which there is a narrow entrance. Anchorage may be obtained in 12 fathoms with the *vantay* on Sablayan point bearing west, at a distance of a quarter of a mile from the beach under the vantay; and in 9 fathoms further in with the vantay bearing W. by S., but great caution is necessary as the reefs do not show well. The inner lagoon is only fit for the native coasters.

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* The description of this bay is by Captain Maclear, R.N., of H.M.S. *Flying Fish*. *See* Admiralty plan:—Ports in the Philippine islands, No. 949, $m = 3$ inches.

Sablayan town on the western side of the anchorage, contains 1,600 people; there is a church and school, but the Padre is the only person in the town who can speak Spanish. Fowls, fish, and coconuts are obtainable in small quantities; water can be obtained from wells dug through in the coral.

The coast from Sablayan anchorage trends in a S.E. by S. direction for 35 miles to Mangarin, and is generally low, with sandy shores. There are high lands a considerable distance in the interior, and extensive plains to seaward.

Dongon bay, situated 7 miles to the southward of Sablayan anchorages, lies to the eastward of a low, sandy point of the same name; vessels can anchor here in front of the low sandy shore, protected from northerly winds.

Iriron bay, about 8 miles south-east of Dongon bay affords good anchorage during the north-east monsoon; a village is situated on the north side of a small river, but no supplies could be obtained.

Lumintau point lies 6 miles south of Iriron bay; a shoal only two or three yards in extent is reported to lie half a mile N.W. of the point; it is not shown on the charts.

MANGARIN BAY,[*] 13 miles south-east of Lumintau point, and north of Ilin island, is sheltered from all winds by Ilin island, and the long peninsula Mangarin point, which terminates in a sandy spit. At the entrance of the bay, off the spit, the depth of water is 4 or 5 fathoms, but the interior is very shoal, and the town of Mangarin, 1½ miles N.E. of the spit, is only accessible to boats The town contains about 1,900 inhabitants. Few supplies are obtainable, and those are very dear; good water is not obtainable; the climate is unhealthy, because of the marshy surroundings.

Donjon bank, which lies 4½ miles W. by S. of Mangarin point is a coral bank, rather more than half a mile in length; the centre part uncovers at low water, the remainder is covered by about

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[*] *See* Admiralty chart:—Semirara, Ilin, and Ambolon islands, No. 971; scale, *m* = 1 inch.

2 fathoms water. At a third of a mile S.S.W. of the southern edge of Donjon bank the chart shows the northern head of another bank, the extent of which to the southward and westward is not known. The lead gives no indication of approach to these banks, there being no bottom with 15 fathoms at a quarter of a mile to the westward.

Manadi bank lies 2¼ miles E. by N. of Donjon bank, and is similar to it. Between Manadi and Mangarin point there is a third bank not named on the chart.

If proceeding to Mangarin bay from the north-west, a safe channel will be found by passing to the north of Donjon bank, and south of Manadi bank, anchoring the moment the channel between Ilin and Mindoro is fairly open.

Ilin island, fronting the south-west part of Mindoro, is 10 miles long N.N.W. and S.S.E., with 4 miles greatest width; it is wooded and hilly, the highest summit, on the northern part of the island, being about 850 feet above the sea. The northern, eastern, and southern shores are clean and steep-to, but from the north-western part, a reef projects more than a mile out, and off the end of this reef there is a detached patch with 2 fathoms on it.

Clearing marks.—To clear the reef off Ilin to the westward, the west coast of Ambolon island must not be brought to bear west of south; and to clear it to the south-west, the south-west point of Ilin should not be shut out by the western point.

Anchorage.—The town of Ilin, containing about 500 inhabitants, is in latitude 12° 15′ N., one mile to the northward of Ambolon island. Good anchorage will be found in 10 fathoms off the reef that borders the coast, with the southern large house of the town bearing east, about half a mile from the shore. A channel, staked by the natives, leads up to the settlement, where a stream delivers itself into the sea; but much sweeter water was found trickling over a cliff just round the town point, to the southward, to which the boats had easier access, and from which the *Samarang* was readily completed with water. Of the other source, a most excellent run of water was found, but it is used for all purposes by the people, and difficult to embark, excepting at high tide, owing to the shore being dry at least a cable from the mouth of the stream. Fowls, eggs, grain, and vegetables were procured at reasonable prices.

Ambolon island, is 3 miles long north and south, and 2 miles wide; it is about 550 feet high at the northern part, and surrounded by a very narrow fringe reef always visible, and easily avoided. It is almost, if not quite, divided by a swampy lagoon which forms a small harbour to the south-west, with Kukurrayan islet at the entrance.

Bank.—A circular, rocky bank, three-quarters of a mile in diameter, covered by 2 fathoms water, lies two-thirds of a mile S.S.~~W.~~E of the south point of Ilin, having a rock above water at its southern part. The south-western side of this shoal has not been sounded, care must therefore be taken in rounding it. Belcher gives the following marks for the southern part of the shoal. The tail of the shoal is exactly on the line of contact of Ilin and Ambolon extremes at the moment that Ambolon outer point shows clear of the smaller semi-detached island (to the southward). Hc 4112.42

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The strait between Ilin and Mindoro is free from danger, and the *Samarang* passed through it; but owing to the prevalence of light airs, the passage should not be attempted without a fair wind. Caution must be used when entering Pandarochan bay from the northward by this strait, for the spit off Mindoro shoals suddenly from 10 to 3 fathoms. The channel should therefore be kept well open, borrowing rather on Ilin until Garza island is nearly locked in by the eastern point; then haul easterly, anchoring in 12 fathoms.

Lalauigan or Gomez bay, on the Mindoro coast about the middle of the strait, is only fit for coasters to whom it affords anchorage in 1½ fathoms.

Pandarochan bay, formed between points Burankan and Ilin, the south extremes of Mindoro and Ilin islands, is safe throughout, affording excellent anchorage and shelter from northerly winds at the mouth of the strait in 10 or 12 fathoms. Garza island and its extensive shoal also offers shelter from strong easterly gusts.

No inhabitants were noticed in Pandarochan bay.

Garza island, which lies 2½ miles from Burankan point, (the eastern point of Pandarochan bay), is low and sandy, and covered with trees; it is surrounded by a rocky reef which extends 2 miles to the southward, covered in places by only 2½ fathoms of water. There is a small sandy beach on the north part of the island, near which anchorage can be had in 8 to 5 fathoms depth, at a distance of half a cable from the beach.

Dominga shoal, consisting of sand and rock, on which the *Dominga* sounded on the 22nd May 1888, while on a voyage from Paluan to Lalauigan, and obtained depths of 8 to 9 fathoms, is reported by the natives of Ilin to have a least depth of 3¾ fathoms. It is stated to be two miles in extent, and to be situated with the summit of

Ambolon island bearing N.W. ½ N., and the northern point of Semirara, E. by N. ½ N.

MINDORO STRAIT.—This wide strait, separating the Kalamianes from Mindoro island, is one of the most frequented channels for vessels which leave the ports of China for India towards the end of April, and in May; and at all times of the year from the ports of China to Australia.

It is divided into two passes by Apo reef.

APO REEF was examined by the surveying ships *Discovery* and *Investigator.* The position of the islets to the westward were determined by the *Samarang*, and the extent of the bank was verified in 1872 by the *Mindoro.* From the northern extremity the S 33 E shoal extends S.E. by S. 7½ miles, where it forms a very narrow spit or east point; from the east point the southern extreme bears S. 35° W., distant 5½ miles, and between the two points there are several gaps in the shoal, having 9 feet water. On the western side there are two islands; the western one is largest, being about half a mile in diameter, and covered with trees; white beaches line its northern and eastern side, and a surrounding reef projects about half a mile. This island does not appear to be connected with the Apo shoal, but about 1½ miles E.N.E. of it there is a small island, formed of barren black rocks, on the south-west part of the shoal. From the centre of the large island the north point of the shoal bears N. 24° E., distant 7 miles; the eastern point N. 81° E., 8 miles; and the south point S. 56° E., 6¾ miles.

The whole extent of the shoal is 10 miles from its north to the south point, and 9 miles from its east point to the western part of the large island. There are two high black rocks N.E. of the small island, which may be seen about 6 miles off, and the islands in clear weather are visible from an elevation of 20 feet, about 10 miles. At low water many small rocks are dry on the shoal, particularly along its north side.

If intending to pass between the coast of Mindoro and the Apo shoal in the night, keep about 6 miles off Pandan islands, as the eastern point of the shoal is narrow, and should the wind be westerly, it would not readily be perceived, nor would there be breakers to make known the approach to danger. Whilst examining the Apo shoal, the *Discovery* and *Investigator* were frequently near it without obtaining soundings, and the boats found it very steep-to in all parts. Land and sea breezes were experienced here in March, the latter from

West and S.W., with the tide or current setting northward ; land and sea breezes prevailed also to the westward of the Kalamianes.

APO EAST PASS is 14 miles wide between Apo reef and the nearest part of the coast of Mindoro ; with the exception of Discovery bank the pass is quite clear.

Discovery bank, on which the *Discovery* anchored, was surveyed in 1872 by the Spanish surveying ship *Mindoro*, which anchored on it several times. It is 1¼ miles long, north and south, and very narrow ; the least water on it is 9 fathoms. The sea does not break on the bank, nor is it marked by any discoloration of the water. From the centre of the bank, the northernmost of the two small Pandan islands off Mindoro bears N.N.E. ¼ E. ; Mount Kalavite N. by W. ½ W. ; and Apo islet E. ½ S.

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Saraceno bank.—This bank appears to be 1¾ miles in extent from north to south, and the same from east to west with a least depth of 14 fathoms. The shallow part is of red coral, but as the depth increases the character of the bottom alters, and at 50 fathoms it consists of coarse sand and gravel.

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From a position in 16 fathoms, Mount Ilin bears N. 61° E., Mount Ambolon, N. 70° E., and the south point of Ilin East.

Leonidas shoal.—This shoal appears to be 3½ miles long north and south, and 2½ miles wide from east to west and to be composed of coarse sand with shells and coral. From the position of least depth in 8 fathoms mount Ambolon and mount Ilin are nearly in the same line N. 36° E., the south point of Ilin N. 67° E., and mount Tundalara S. 88° W.

Falmouth bank.—In 1870 the Spanish gunboats *Mindoro* and *Caviteño*, searched for this bank without success, and without finding bottom with 55 fathoms of line in the place assigned to it ; the bank has been therefore erased from the Spanish chart. The following careful description is, however, here given from Horsburg : Falmouth bank, lying betwixt Kiniluban and Mindoro, is about 6 miles extent north and south, with various depths on it, from 60 to 20 fathoms ; and the least water found on it was 11 or 12 fathoms, coral rock, with the island Ambolon N. 3° E., and Semirara from N. 60° E. to N. 63° E. ; the Coutts had 68 fathoms, next cast 14 fathoms, with Semirara N. 63° E., southern part of Kalamianes W. 5° S., Kiniluban S. 20° W., and carried soundings of 12½ to 15 fathoms for a considerable distance, steering S.S.E. There are other coral banks in this neighbourhood, detached from the Falmouth bank, on one of which we had several casts in the night of 22 to 25 fathoms; then no ground at 80 fathoms. By the bearings at daylight, this bank appeared to bear from Kiniluban N. ½ E., distant *about* 5 leagues, and E. ¼ S. from the south extreme of the Kalamianes.*

Panagatan reef. — Panagatan reef or group, called also Camden ~~shoal, at~~ the south-eastern entrance to Mindoro strait, extends 4 miles east and west, and about the same north and south. It has three islets on it, with trees sufficient, as well as breakers, to warn the navigator by day, but the southern dangers extend 2 miles from any of the islets, and caution should be observed at night. The name Panagatan appears to be the Malay or Bisayan term for large shells, chiefly of the *tridacna* species (or Chama gigas), which abound on this reef.

The depth over the shoal, which is purely coralline, varies from one to 6 feet, and some of the patches are at times uncovered. The soundings, vary from 3 to 30 fathoms, along the edge of the reef, and off the south-eastern extremity is a bank where a vessel might find temporary anchorage; it extends about a mile or more to the south-east, having at its extremity 50 or 60 fathoms. This anchorage may be found easily, as the western extremities of the large island, and the western extremities also of the two small islets lead up to it. The surf line and the lead will sufficiently guide to safe and well protected anchorage for temporary refit in case of necessity.

APO WEST PASS, between Apo bank and Kalamianes islands, is 19 miles wide between Apo shoal and Tara island—the northernmost of the Kalamianes; but Hunter and Merope shoals lie in the middle of the northern entrance.

Hunter shoal, on which the sea breaks, consists of a rocky ledge about 2 cables in extent with 12 fathoms on it, and a patch of 8 feet on its south extremity. The shoal is surrounded by a bank the depth over which varies between 24 and 65 fathoms. From the shoal Mount Kalavite bears N. 15° E., and Apo islet East.

Merope shoal, on which the sea breaks, lies 5½ miles N.E. of Hunter shoal, and consist of a ridge 1⅓ miles in extent north and south, and half a mile wide; it is covered by 2¾ to 9 fathoms, and no bottom with 90 fathoms within a quarter of a mile. From the shoal Mount Kalavite bears N. 11° E., Apo islet S. 67° E., and Mount Tundalara in Busuanga South. (?) l'ille west

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* Vol. II., 8th Edition, page 576.

Current.—During the Spanish survey of these shoals, 1872, a current to the S.E. of 0·6 miles an hour was observed.

The KALAMIANES are a group of high islands lying between the north-east end of Paláwan and Mindoro, and extending between the parallels of 11° 39′ and 12° 20′ N., and the meridians of 119° 47′ and 120° 23′ E. Busuanga, the largest island of the group, is about 34 miles in extent, N.W. by W. and S.E. by E., and 18 miles broad. It is very irregular in form, being indented with numerous deep bays. The islands and reefs which front its north-east side form the western side of Northumberland strait.

These islands form, with the northern part of Paláwan and the Cuyos islands, a province, the capital of which is at port Tai Tai. The climate of these islands is in general hot and unhealthy: intermittent fevers and cutaneous diseases prevail, attributable in all probability to the great moisture and the insalubrious quality of the drinking water. All these islands are, generally speaking, hilly and broken. The industry of the locality is in collecting *Salanganes* (edible bird's nest), honey, and wax; but cultivation is not practised to any great extent. The forests produce good timber for building or cabinet work.

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The west coast of the Kalamianes, Linapakan, and its surrounding islands, and the coasts of Paláwan, are described in the China Sea Directory, Vol. II.

ISLANDS and DANGERS NORTH-WARD and EAST-WARD of the KALAMIANES.—The following description is from the Spanish Derrotero 1879, and from Captain Maclear, H.M.S. *Flying Fish*, 1885.

Kolokoto, or North rock, is the north-western and highest of four large black rocks, which appear as one when seen S. 54° E. It was estimated to be 100 feet high, and the next largest to it 60 feet high. Kolokoto is the northernmost of the islands which lie on the north side of Busuanga, and may be seen 13 or 14 miles from the deck.

Soundings.—The charts exhibit no soundings within 20 miles of the west side of Kalamion, but beyond that distance are irregular soundings, 19 to 54 fathoms. In lat. 11° 52′ N., long. 119° 26′ E., is a patch of 9 fathoms, with other patches, 12 to 15 fathoms, within a few miles of it. The soundings near the islands westward and north-eastward of the Kalamianes have been given with the description of those islands; they are also very irregular, 17 to 30 fathoms, with patches of 5 and 8 fathoms, and it would appear necessary to be on the look-out for shoal water when navigating in this locality.

Near North rock the soundings to the northward are 40 and 50 fathoms, and the same depths between it and Busuanga, on a muddy bottom.

A patch of 5 fathoms is shown on the charts 14 or 15 miles to the northward of the north point of Busuanga, in about lat. 12° 35′ N., long. 119° 52′ E. The *Flying Fish* anchored on this bank, which is of small extent, and sounded over it with boats, but found nothing less than 10 fathoms, with 25 to 30 fathoms around ; and no bottom with 250 fathoms close to the northward, which would indicate that the patch is on the northern edge of the bank on which the Kalamianes are situated.

Dimipak, or High island, lies about 2 miles to the northward of the north point of Busuanga. It is a small island, not quite 2 miles in extent, and the channel between it and Busuanga does not appear to be free of danger, as some rocks were seen above water eastward of the island.

About a mile north-westward of Dimipak island are rocks above water, one of which, named Sail rock, 140 ft. high, is very remarkable ; and 1¾ miles north-westward of this lies a large black rock, named N.W. rock or Dichilem. When passing between these the *Discovery* had 38 fathoms, and about 2 miles N.N.E. of N.W. rock, passed over a coral spot in 8 fathoms.

Dumunpalit (Turret) island, bearing S. 50° E., 7¼ miles from North rock, is 816 feet high, small and rocky, having several detached rocks about it, and a remarkable hummock on its south-west point, somewhat like a turret.

ISLANDS NORTH-EAST of BUSUANGA.—Nanga islands, lying 15 miles E.S.E. of North rock, are two small wooded islands which have sandy beaches, and about 1½ miles to the N.N.E. of them there is a black rock above water. The largest of these islands is 344 feet high. The chart shows them to be surrounded by a reef extending nearly a mile from them.

Kamanga islands, south of Nanga, are about 400 feet high, small and steep-sided ; the chart shows them to be surrounded by a reef.

Tara island.—When seen from the northward this island shows a triple summit to its north-west end ; whilst its southern part looks like a separate island, saddle-shaped. From the eastward the island appears of uniform height. The southern summit is 730 feet high, and the northern one 560 feet. On the south-west side there is good anchorage in 10 fathoms in a gap in the reefs which extend westward from the island, in some places to a distance of half a mile From the anchorage the following bearings were taken : Kokonongon hill S. 69° W. ; Kamanga island N. 80° W. ; and the western point of Lagat island S. 7° W. The island does not appear to be permanently inhabited ; in March, 1885, it was occupied by parties from Busuanga, burning the grass, and digging cassava.

Lagat is a small island 334 feet high, surrounded by a reef with a narrow passage between it and the reef off the south end of Tara.

Soundings.—A patch of 3 fathoms lies west 1½ miles from the south end of Tara ; the soundings about the northern end are irregular ; a patch of 6 fathoms lies between Tara and Nanga ; and a patch of 9 fathoms lies N. ½ W. 8 miles from the northern end of Tara.

Bantak **Botak island,** 800 feet high, is fairly well cultivated. Off its northern end there is a queer pin-shaped rock, and off its southern end are some sharp-pointed rocks. The vicinity has not been sounded.

Kalanhayaun island, flat topped, 500 feet high, is connected with Botak by a reef.

Lubutglubut island, 660 feet high, is very bold to the southward, and appeared inaccessible ; north of it a reef extends to the distance of one mile, with large rocks above water. A group of rocks without name on the Spanish chart lies south 1½ miles off Lubutglubut. The highest of the group is about 380 feet above the sea. The vicinity has not been sounded.

The EAST COAST of BUSUANGA is formed by a range of hills running in a N.N.W. and S.S.E. direction, having an average height of 1,200 feet. The most conspicuous among them, seen from the northward, is a three-headed peak 1,880 feet high, in lat. 12° 6′ N. long. 120° 16′ E. Mount Tundalara has a smooth summit with a small knob on it, and is in lat. 12° 02′ N., long. 120° 13′ E. ; it cannot be distinguished from the northward. Over Kokonongon point there is a conspicuous cone 1,300 feet high.

Minanga bay is almost filled up by islands and shoals. From point Alonon a bank of coral extends three miles to the N.E., with soundings of 5½ to 12 fathoms over it, shoaling towards the coast.

Port Borak has not been surveyed ; it is reported to be very narrow, but sheltered by the islands Dinaran and Matayan ; and to afford anchorage in 2½ to 9 fathoms.

Dinaran island is saddle-shaped ; the two summits are about the same height, 580 feet above the sea ; it is surrounded by a reef, which extends to half a mile on all sides, except the western, which is steep-to and clear ; a rocky shoal lies 1½ miles to the S.E., with the island Matayan in the middle of it ; this shoal is 2½ miles in extent, north and south, and almost joins the reef that borders Dinaran island.

Dibitak island is about 300 feet high. H.M.S. *Flying Fish* anchored in the bank north of Dibitak in 17 fathoms, with the summit of Dibitak bearing S.S.W. ¼ W., and a rock off the east point of Busuanga E. ½ S. On entering this bay the ship passed over a ledge of 4 fathoms, extending half a mile from east point, so narrow that the cutter sounding ahead of the ship missed it.

Koron island is rocky and precipitous, about 1,200 feet high, and nearly the same height from north to south. The south end terminates in a sharp steep point, named point Kalis, which can be passed close to. About the middle of the eastern coast there is a shoal of sand and coral, covered by 5½ fathoms; and another shoal, of 3½ fathoms, lies midway between Koron and Dibitak.

Koron strait and **Koron bay** are described in China Sea Directory, Vol. II.

Delian island, situated 3½ miles to the N.E. of point Kalis, is 450 feet high. The shores are steep-to and clean, with the exception of a few rocks close to its southern end ; and a reef, of about a cable's extent, on its N.E. side. On the west side there is a white sand beach, with a short spit.

SHOALS EAST and SOUTH-EAST of KALAMIANES.—Framjee bank, on which the British ship *Nerwangee Framjee* is reported to have touched in 1878, lies 12 miles east of the east point of Busuanga. The boats of H.M.S. *Flying Fish* sounded over this bank, but found nothing less than 5 fathoms. From this position of least water the islet Lubutglubut, S.W. of Kalanhayaum, bore N.W. ¾ N., and the summit of Delian S.W. by W. The bank extends about 3 miles in a S.W. by W. and N.E. by E. direction, and has a general depth over it of 8 to 13 fathoms, and is surrounded by 40 to 50 fathoms. The north-west side is steep.

Magallanes bank, the southern end of which is 1½ miles N. by E. of Narvaez, is nearly 3 miles long N.E. and S.W. From the position of least water, 1½ fathoms, on the northern end, Matayan island bears N. 28° W., and point Kalis S. 73° W.

Narvaez bank, with 4½ fathoms least water, lies with Matayan island bearing N. 20° W., point Kalis west.

Aguirre bank, S.E. 17 miles off Delian island, is 1½ miles in extent, N.N.W. and S.S.E., and one mile wide; the least water on it is 4½ fathoms.

Areta shoal (position doubtful) was originally reported by the British ship *Areta* in 1863; the following bearings being taken from the ship when in 9 fathoms water, and just clear of the shoalest part of the shoal where white and red coral heads were distinctly seen:—Peak of highest island Kiniluban group S. by E ¾ E., Manamok island S. by W. ¼ W. The site was searched by the Spanish gunboat *Mindoro* in 1872 and no bottom was found at 55 fathoms, but in 1877 the ship *Monarchy* sounded in 7 fathoms on a bank of fine white sand and coral, placed by her in lat. 11° 33′ N., long. 120° 46′ 30″ E.*

Alpha shoal lies 4 miles E. by N. of the north end of Delian, and is covered by 6 fathoms, with 14 fathoms close to, and 40 to 50 around it.

Beta shoal lies 7 miles S. by E. of the south end of Delian, and is covered by 6 fathoms, with 20 fathoms close around it.

KABULAUAN ISLANDS are a little group to the eastward of Linapakan, composed of two larger islands and several smaller ones. Kabulauan, or Sombrero, is 2½ miles long from N.W. to S.E., with a hill of moderate height on its north-east point. On the S.W. side there is a small bay bordered by a reef, with 4 to 11 fathoms depth. The north side of the island is foul. On the south side there is a rock which appears to be connected with the island by a shoal of 2½ fathoms; at 2 miles west of the island there is a patch of 4½ fathoms.

Nangalao, 4½ miles to the N.E. of Kabulauan, is about 2 miles long N.E. and S.W., and rises to a central hill about 500 feet high. Two small islets, joined to the south point by a reef, form a bay with 5 to 11 fathoms depth. The channel between Nangalao and Kabulauan has not been sounded; there is an islet in the middle of it.

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* Naut. Mag. 1864, p. 166; Spanish Derrotero 1879, p. 457; U.S. Hyd. Notice No. 27 of 1877.

Kanaron island, lying S.E. by E. 12 miles from Kabulauan, is small, about 300 feet high, and bordered on the north side by reefs and rocks to the distance of one mile. Solitario, 40 feet high, lies 5 miles N.E. of Kanaron; and Salimbubug, 100 feet high, lies 5 miles N.W. by N. of Kanaron.

SULU SEA.—The space included between the Sulu archipelago to the south, and Mindoro to the north, and having the Philippine islands on the east, and Paláwan on the west, is distinguished by the name of the Sulu sea. Although of great depth, 2,550 fathoms, this sea, which is in connection with the China and Celebes seas, and also with the Pacific by San Bernardino and Surigao straits, has a minimum deep-sea temperature of 50·5°, reached invariably at 400 fathoms. As this temperature in the China sea is at the depth of 200 fathoms, and in the Celebes sea at 180 fathoms, and in the Pacific at 230 fathoms, it may be inferred that the Sulu sea is prevented from freely interchanging its waters with those seas by ridges which do not exceed those depths.

Winds.—In the Sulu sea easterly winds with fine weather prevail in October, and the N.E. monsoon is not established until November. In January and February it blows hardest, but not with the force of the China seas, and it is felt strongest before the openings between Panay and Negros, and Negros and Mindanao. At the end of May S.W. winds begin to blow, and in a month become established, to terminate in October, bringing with them a season made up of rain squalls and tempests, which take place principally in July and August. In September a heavy mist hangs about the coast of Mindanao.

In the Sulu sea the east or N.E. monsoon is not a steady fresh breeze, but often variable. Near Mindanao the northerly winds never blow fresh, and light changeable winds often displace them for several days. This often occurs at the end of January, and it is considered that the same winds prevail from the Sulu archipelago to Manila.

Cyclones occur occasionally, chiefly at the changes of monsoon, and appear to pass chiefly over the northern part of the sea.

Currents.—During the N.E. monsoon the surface drift is with the wind about three-quarters of a mile an hour. In the southern part of the sea there is generally a north-west or westerly current in the neaps between Sulu and Basilan, and in the tracks thence to Balábac strait. In March and April the current sets mostly to the eastward among the Sulu islands, but it sets to the westward at the same time in the openings of the Philippine islands to the north of Mindanao.*

Observations of currents during the S.W. monsoon are too scanty to afford reliable information.

Tidal streams.—Two tidal waves enter the Sulu sea and passages between the Philippines archipelago from opposite directions; one from the China sea through the western openings, the other from the Pacific through the eastern straits, viz., San Bernardino, Surigao, and Basilan. These waves meet in the many channels between the southern islands.

The wave from the China sea enters that sea from the Pacific by the wide opening between Formoza and Luzon, and passes from north to south along the western shores of Luzon and Paláwan, and through the Verde island passage, Mindoro strait, Linapakan, and Balábac straits.

The Verde island stream, after passing south along the coast of Luzon, and deflecting some of its waters into the bay of Manila, continues along the coast to the southward and eastward as far a Point Puñas, where it branches. One stream running to the north east round Tayabas bay, and north and east of Marinduque, through Mompog strait, reunites with the other branch which passes south-east along the Mindoro coast as far as point Dumali, and then to the eastward, south of Marinduque as far as the Bondog peninsula, where it meets the flood stream from the Pacific which has passed through San Bernardino strait. The northern part of the Verde island stream which follows round the bays of Taal (Balagan) and Batanga, reunites with the principal current near Verde island, producing violent tide rips and eddies in that part of the channel between points Puñas and Escarceo.

The flood stream that enters by Mindoro strait follows the coast of Mindoro, setting to the south-east (as far as point Nasog in Panay), part of it continuing round the coast of Mindoro to the northward to point Dumali, where it meets the stream through Verde island passage. The rest of the stream divides at the north-west point of Panay island. One branch flows along the north coast of Panay past point Bulakan and the Gigantes islands to point Bulakaki, the north point of Sebu, where it turns to the southward and meets the stream from the Pacific through Surigao strait, about 6 miles south of Kamotes islands; it also flows into Iloilo strait and Tañon strait, in both of them meeting the flood which has entered from the southward, on the parallels of the north end of Negros, and of Tagas respectively.

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* Horsburg, Vol. II., p. 516.

The other branch, turning to the south from the north-west point of Panay, and being joined midway by the stream setting eastward from Cuyos islands (or Linapakan strait) continues coasting Panay and Guimarás islands into Iloilo strait, until it meets the other branch described above. Between the Kalamianes and the north end of Paláwan the flood stream sets to the S.E. and the ebb to the N.W.

The flood stream entering by Balábac strait, turning to the N.N.E. along the east coast of Paláwan, spreads itself like a fan over the Sulu and Mindoro seas from north-east to east, forming the current from west to east felt between Cuyos islands and Panay, and also that which sets to the south of Kagayanes, where it is said to meet the stream from Surigao strait (and Sebu sea) approximately in the meridian of Kagayanes.

In the Sibutu passage the flood stream sets to the northward and westward ; and also in the Sulu archipelago the flood stream sets generally northward and westward, but takes many local directions among the islands, where it also appears to be influenced by the monsoon currents.

Through Basilan strait the flood stream makes to the westward, and passes up the west coast of Mindanao to the northward until it meets the flood stream from Surigao strait somewhere midway on the coast.

The time of high water of the wave that enters from the China sea seems to be from 10 to 12 hours, and of that which comes from the Pacific through the eastern and northern straits from 6 to 7 hours.

CUYOS ISLANDS.*—This group occupies a circular space of about 45 miles diameter on a bank covered by 14 to 40 fathoms water with deep and clear passages between them. It can be passed on either side, but the route to the eastward is most direct, and is generally used in the N.E. monsoon from Mindoro strait to Basilan strait. All the islands, with the exception of Kiminatin, are of volcanic formation.

Kiniluban group, the northernmost of the Cuyos islands, consists of several islands and rocks on a circular reef about 6 miles in diameter. The largest island of the group rises to a central hill

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* *See* Admiralty chart, Sulu or Mindoro Sea, Eastern part, No. 2578 ; scale, $m = 0{\cdot}1$ of an inch.

981 feet high, precipitous and almost bare. The northern ends of the islands are very abrupt, and terminate in jagged needle-shaped rocks. An opening in the reef leads to the S.W. island, which is sparsely populated; it has a church and school, and is occasionally visited by the padre from Cuyo. H.M.S. *Flying Fish* anchored on the S.W. edge of the reef in 12 fathoms, with Kiniluban summit bearing N. 57° E. and Oko islet S. 26° E.

A white rock 30 feet above high water springs lies S.S.E. 3½ miles from the largest island, and has a sand bank 6 feet above water, with bushes on it lying S.W. by W. half a mile from it, and joined to it by a breaking ledge. The water appeared shoal for a quarter of a mile S.W. by W. of the sand bank.

Pamálikan is low and sandy, covered by bushes, and surrounded by a reef.

Manamok, 714 feet high, is surrounded by a reef which projects one mile to the S.E. The eastern side of the island is precipitous, but the western side slopes gently from the summit, and juts out in a V-shaped peninsula, with a small cone on the end. The western side has trees fringing the beach, and is cultivated. H.M.S. *Flying Fish* anchored on the S.W. edge of the reef in 7 fathoms, with the summit of the island bearing N. 35° E., and Imaruan island S. 49° E. Canoes came off, bringing pigs, fowls, and coco-nuts for sale.

A bank, having 6 fathoms on it, lies 7 miles east of Manamok: its extent was not determined.

The islets Lean, Imaruan, and Dit, are high and steep; Oko is small; a sounding of 9 fathoms was obtained N.W. of it.

Marakanao and **Matarabis** islands are high, clean, and steep-to. Captain Park, of the *Luzon*, reported, in 1889, that he saw the bottom and obtained soundings of 10 to 16 fathoms, with suddenly no bottom, north-eastward of Matarabis. Position given, latitude 11° 12′ N., longitude 121° 12′ E.

Chinaman shoals are two coral shoals on the north-eastern edge of the bank; the outer shoal has 5 fathoms least water over it. From it the following bearings were taken:—Dit summit S. 65° W., distant 11 miles, Marakanao S. 25° W., Maratabis S. 12° E. Inner Chinaman shoal is 2¾ miles S.W. of the outer one, and has 4 fathoms on it; both patches are small, about a mile in diameter, with 25 fathoms around and between them. Immediately north-east of Chinaman shoals, the water deepens rapidly to 46 fathoms, but to the southward of them the eastern side of the bank seems more sloping.

Sultan bank, which lies nearly E.N.E., 20 miles from Chinaman shoal, is of circular figure, one mile in diameter; the least depth over it is 7 fathoms nearly in the centre, with 9 to 18 fathoms over the rest of the bank, and no bottom with 55 fathoms at one mile distance. From the bank the following bearings were taken :—Mount Agutaya S. 66° W. ; Marakanao S. 69° W. ; Dit islet S. 77° W. A line drawn E. ½ E. from the summit of the highest Kiniluban island to Seco bank would touch the southern edge of Sultan bank.

Agutaya.—The south-western part of this island is a smooth round back, 405 feet high ; to the north-east it rises in three hills, the highest of which is 956 feet. The town and fort are on the western point. The island is very unproductive, and in 1886 was suffering severly from drought. The population was estimated at 300 people, though given in the Derrotero as 2,200. It is surrounded by a reef which dries out about half a mile on the western side, and is very steep. H.M.S. *Flying Fish* anchored off the south-western edge of the reef in 14 fathoms, with the summit of Dit islet in line with the western extreme of Agutaya.

A group of pointed rocks about 15 feet above high water, lies N. 69° W., 2½ miles from the north extreme of Agutaya ; and another group of rocky islets, named Guinlabo, 223 feet high, lie south of Agutaya.*

Cuyo island† is the most important of the group ; its total length including Bombon, which is joined to it by a low, narrow, neck of land covered with trees, is a little over 7 miles, and its greatest width is 4 miles. The western side is bordered by reefs ; the eastern side has not been closely examined, but appeared to be clean and steep-to. From the shores on all sides the island rises gradually to a central peak, named Aguado, 608 feet above the sea.

Cuyo is very fertile, and produces cacao, coffee, cotton, maize, rice, coconuts, oranges, bananas, and pine-apples; the natives manufacture piña in their houses. Cattle and horses, pigs and fowls are plentiful ; but water is scarce and not good ; it is obtained from wells, and depends on the rains.

The town, of 8,140 inhabitants is on the western side ; it is pretty and clean, with regular streets lined with coco-nut palms. The houses are raised on piles, and painted or whitewashed. A fort, built in former times against pirates, is on a sand-spit near the town: no guns are now mounted on it. The church is inside the fort.

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* **Reported danger.**—Mr. Samuel Farrell, commanding the British barque *Belted Will* in 1880, reported the existence of a rock having 3 feet of water over it ; from it Paya island bore W. ; Agutaya N. ½ W. ; and the north extreme of Cuyo island S.E. by S. ½ S. This locality was passed over by H.M.S. *Flying Fish*, and by her boats, but no signs of the rock were seen.

† *See* plan on chart 2,578.

Bisuk~~ei~~ay is a small island, 386 feet high, close to the S.W. part of Cuyo, and affords shelter during the south-west monsoon. The channel between it and Cuyo is very much narrowed by reefs, and only used by coasters.

Anchorage.—There is good anchorage, on sandy bottom, west of the town, in a break in the reef. The *Flying Fish* anchored in 7 fathoms, with Aguado peak S. 79° E., Bombon summit N. 54° E., and the islet Silat, seen in the gap between Cuyo and Bisukei, S. 10° W. This is the anchorage used by the monthly steamer from Manila.

Tides.—It is high water, full and change, at 11h. 30m.; springs rise 6 feet.

Communications.—A steamer leaves Manila every fourth Wednesday with mails for Kulion, Cuyo, Princesa (Iuahit), Balábac, Sulu, and Samboanga, returning *vice versâ* to Manila, completing the round to Manila again in 16 days.

Putik is a small island on the reef bordering Cuyo and Bombon islands. Indagami and Bararin, are wooded, rocky, and steep. An insulated rock, 10 feet above water, lies W. by S., one mile from Indagami.

Between the islands Cuyo, Kanipo, Bararin, and Bisukei the soundings are irregular, and generally under 10 fathoms, with patches of 2½ to 4½ fathoms in places. These patches do not show except when looked down upon from a height, or when the light is favourable. The most important of them, being near the route taken to enter Cuyo roads, is one of 4½ fathoms on the eastern side of a 7-fathom bank; it bears N. 82° W. from the flagstaff on Aguado. H.M.S. *Flying Fish* passed through the passage between Indagami and Putik, with the eastern part of Siparei island open behind the eastern extreme of Takbubuk.

The islet Sipar~~ei~~ay, lying N.N.E. of Cuyo, is rugged and has a remarkable pinnacle rock on its south side, apparently left standing whilst the rest of the island has worn away. The *Flying Fish* anchored S.W. of the islet in 10 fathoms water. Takbubuk is smooth and bushy. Tagauayan consists of two islands, united at low water by a ledge. No anchorage was found off it. The northern part of Kokoro islet is low, and bordered by a small reef; to the southward the island rises to a double mound, and is steep-to on that side; it is inhabited, and under cultivation.

Guinlabo, Putunga, Pamitinan, Lubid, and Kanayan need not be specially described; they are small, hilly, and steep.

Tabak is a group of rocks 8 feet above water; a shoal that breaks lies about one cable north-east of it, with 11 fathoms between it and the rocks; there are 20 fathoms all round at half a mile distance. Paya,* the westernmost islet of the group, is 90 feet high, and was visible with mirage at a distance of 14 miles. It is composed of basalt, is steep-sided, and has only pandanus growing at the top. The *Flying Fish* steamed round it, carrying 20 fathoms at the distance of half a mile.

South and south-west of Cuyo islands are several islets: Imalaguan, Silat, Kapnoyan, Malkatop, and Pangatatan, which need not be described in detail; they are all steep and clean. Kapnoyan only is inhabited.

Kiminatin is of quite a different character to the other islands of the group. It is of lime-stone, and the adjoining islets, Kiminatin Chicos, are of crystalline lime-stone. Kiminatin rises abruptly from a depth of 30 fathoms, and is almost inaccessible; the sides are very steep, and underworn to a height of 14 feet from the surface of the sea. A stunted bush grows on it in places. In the Chicos the water has worn some curious caves.

Santa Filomena shoals consist of three shoals of 3 to 11 fathoms, with over 20 fathoms between them. A rock covered by 2 fathoms was found on the westernmost of them. H.M.S. *Flying Fish* anchored on the edge of the western shoal in 16 fathoms, with her stern in 4 fathoms, on the following bearings: Kiminatin N. 46° E., Lubid N. 2° E.

Between Filomena shoals and Kapnoyan, at a distance of 4 to 5 miles from Kapnoyan, are two more shoals, Ramon and Pacheco; the first has a mushroom coral lump upon it, covered by only 9 feet; the last has 3 fathoms least depth.

White rock lies S. ¼ W. 24½ miles from Cuyo peak; it is 24 feet above high water, and has a white head from bird-droppings; it is steep-to to the southward and eastward, but to W.N.W. a shoal covered by 8 fathoms extends to a distance of one mile: the depth then suddenly increased to 56 fathoms.

Queen of the Seas bank, an 8-fathom patch, was discovered in 1868 by Captain Smiley, of the ship *Queen of the Seas.* The bottom was distinctly seen and the bank appeared to be 1½ to 2 miles in diameter. From this bank, Karlandagan island bore N.W., and Kiminatin N.E. ¼ N.

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* There are two islands of this name in the group.

Sombrero rock, midway between the S.W. end of Panay and Taganayan, one of the Cuyos islands, is not larger than a boat, and is not visible beyond 8 or 9 miles; it generally shows black. From it Mount Aguado in Cuyo bears N. 77° W., and the east tangent of Taganayan N. 41° W.

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KAGAYAN ISLANDS and REEFS.—The Kagayan islands are situated on the margin of an extensive reef, very steep-to, the depth of water at one cable distance from it being over 100 fathoms. It is fringed by a coral reef extending to the north and north-west, but is bold-to on the east, where landing is practicable. The southernmost and largest, Kagayan, is 6½ miles long N.E. by N. and S.W. by S., including Boomboong, and 2 miles wide; it is thickly wooded, and the highest part is 285 feet above the sea. On the southern side there is a village with a fort and church, but the reef which extends nearly a mile to the southward of the village is too steep to afford anchorage; nor is there any anchorage near the neighbouring islands Kagayançillo and Dondonai, but there appeared to be a boat passage inside the reef from the village into the lagoon, and the *Samarang* in 1846 found a northern entrance to the lagoon which would admit vessels of 12 feet draught.*

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The reef extends 8 miles to the northward of Boomboong, and about the same distance to the N.E., including the island of Anuling, which is small, sandy, and covered with brushwood, about 40 feet above the sea. The western and northern sides of this dangerous reef show rocky heads above water, which mark it in day time, but at night there is nothing to warn a vessel of its proximity.

Manukan islet, on a detached reef, has coconut trees on it. The *Flying Fish* anchored on the tail of the reef that stretches westward from the north end of the islet in 7 fathoms, coral, with 33 fathoms under the stern and no bottom with 100 fathoms at a short distance.

Supplies.—The *Samarang* obtained cattle, hogs, poultry, and coco-nuts at reasonable prices, but the island does not afford a healthy supply of water; it is to be obtained from wells near the village.

Nicholson bank.—The southern end of this bank is about 3 miles N.E. by E. from Anuling; it extends N. by E. 8 miles with a maximum breadth of 2 miles. The soundings on it are 3 to 11 fathoms, with frequent intervals of 30 to 50 fathoms.

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* Voyage of H.M.S. *Samarang*, vol. II., p. 96.

Sultana bank.—The southern end of this bank is 12 miles N. by E. of Anuling island, and it extends N. by W. for 8 miles; the northern end is in lat. 10° 1′ N. and long. 121° 22′ E.; the greatest width is less than a mile, and the soundings on the ridge vary from 3 to 11 fathoms. Both banks are very steep on their western sides, having no bottom with 100 fathoms at less than half a mile distance, but sloping gradually to the eastward, the 100-fathom line being at a distance of 6 miles from the shallow ridge.

Between the shallow parts at the north end of Nicholson bank, and the south end of Sultana bank, a distance of 3 miles, the soundings are 16 to 25 fathoms. The tops of the trees of Kagayan island just dip below the horizon at this position.

Kalusa, a small inhabited island, thickly covered with coco-nut trees 60 feet high, lies W. by N. ½ N. 10 miles from the south point of Kagayan island. It is fringed by a coral reef extending to the north and north-west, but is steep-to on the east, where landing is practicable, though difficult, in ships' boats, as there is but little depth over the reef. The channel between Kalusa and Kagayan is deep and safe.

KAVILLI and SANDY ISLANDS, with their outlying reefs, extend 8½ miles in a N.E. by E. and S.W. by W. direction, with a deep channel 1½ miles wide between.

Kavilli or Kauelli island, the northern of the two coral islands, is 124 feet high, covered with trees, and lies about 30 miles S.W. ½ W. from the south-west point of Kagayan island; it is about three-quarters of a mile long, surrounded by a reef extending 2½ miles in a N.E. by E. and S.W. by W. direction.

Sandy island.—The southern coral island is low and surrounded by a reef 4½ miles long, with detached sand cays to the southward and westward of it.

As these islands are steep-to on all sides the mariner should be cautious when navigating in their vicinity, the lead giving no warning.

TUB BATAHA.—This dangerous line of reefs consists of small islets, sand cays, and large boulders, all connected by sand ridges, and fringed with steep-to coral reefs, running south-west and north-east for a distance of about 16 miles.

The north-east islet, which is the highest, is 15 feet above the sea, with verdure in the centre, and lies in lat. 8° 53′ 48″ N. and long. 120° 0′ 45″ E.

The south-west islet is 10 feet above the sea, with the trunk of a large embedded tree on the north-east side. Apparently a channel exists through the reef about 5 miles north of the south-west islet, but it was not examined. Both of these islets were teeming with sea birds, numbers of them flying round the ship before the reef was sighted. As a complete examination of the Tub Bataha reef has not yet been made, the seaman when navigating in this vicinity cannot be too cautious, the lead giving little or no warning. Within the distance of 2 miles from the northern islet of Tub Bataha there is no bottom at 1,000 fathoms.

Temerario rock is shown on the chart in lat. 8° 48′ N., long. 120° 5½′ E., and a reef in position lat. 8° 46′ N., long. 119° 57′ E. These positions have not been examined.*

Jessie Beazley reef, 13 miles N.W. by W. from the northern islet of Tub Bataha, is a small coral reef with a few scattered heads of coral on it, the highest of which, a small pyramidal shaped rock about 4 feet high, lies at its eastern extreme. Its position, determined in 1889 by H.M.S. *Rambler*, is in lat. 9° 2′ 0″ N., longitude 119° 49′ 15″ E.

The original position assigned to this reef in 1865 by the Captain of the *Jessie Beazley* has not been examined, and is still retained on the chart, awaiting further information ; it is shown in lat. 9° 6′ N., long. 120° 4′ 30″ E.

Nicholson was placed on the Admiralty charts in 1865–1867, as in lat. 8° 51½′ N., long. 119° 43′ E. This position was crossed over by the *Rambler* in 1889 without any sign of shoal water being observed, and no bottom at 1,079 fathoms was obtained close to it. It may, therefore, be assumed that this danger does not exist in that position, but for the present it is retained on the Admiralty charts in lat. 8° 51½′ N., long. 119° 39′ E. (position doubtful).

Rosalia.—The Spanish schooner *Rosalia* was reported in 1867 to have been lost on an unknown reef, for which the position assigned was lat. 8° 53′ N., long. 119° 6′ E. The Spanish chart shows also an islet named, Cumi Cumian, in lat. 8° 50′ N., long. 119° 0′ E., position doubtful.

South Tub Bataha.—This reef was supposed to exist in lat 8° 4′ N., and long. 119° 50′ E. H.M.S. *Nassau* tried for soundings there, finding no bottom with 180 fathoms ; 6 miles W. by N. of this position, at noon with good observations, bottom was obtained in

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* *See* Admiralty chart, Paláwan islands, No. 967, scale, m = 0·1 of an inch.

1,878 fathoms, pale yellow sand. As the observations were made on a clear day, and a good look-out kept from the masthead, there is no doubt this shoal has been misplaced on the charts.

Mœander reef, discovered by H.M.S. *Mœander* in 1849, is a sand cay, extending 180 yards in a west north-westerly and east south-easterly direction, 50 yards wide, and 6 feet high, with a large stump of drift wood on it. The cay is frequented by large numbers of sea birds, and is surrounded by a fringing reef steep-to on all sides. Its position, determined by the *Rambler* in 1889, is lat. 8° 7′ N., long. 119° 18′ 50″ E.*

Bankoran island, the centre of which is in lat. 7° 57′ N. and long. 118° 40′ E., is about 4½ cables in extent. It is steep-to on the south and east sides; a reef extends from the island 6 cables to the northward, and 4¼ miles to the north-west; these reefs are steep-to, as 360 fathoms were obtained three-quarters of a mile seaward of their north-west extreme. The island is flat and covered with trees, the tops of which are 140 feet above the sea.

ST. MICHAEL ISLANDS consist of four islets; they lie about 40 miles to the northward of Kagayan Sulu; the largest, Bankawan, being about three-quarters of a mile long; about 2 cables from the north-east point it is nearly divided by the sea. The north-east point rises to a peak 123 feet high.

Bankawan is connected with a small coral islet lying 1½ miles to the northward by a reef extending from the north and west sides, with sand cays and large boulders on it. The islet is steep to the south-east.

Manuk Manukan, the larger of the two south-west islets of the group, is thinly covered with trees, the tops of which are 32 feet above the sea, and lies about W.S.W. 5¾ miles from the north-east point of Bankawan, and is connected by a reef with a small coral islet lying half a mile to the southward. From this small islet, which is 20 feet high, the reef runs to the northward and N.N.W. for nearly a mile and a half, with large lumps of coral showing at low water.

Anchorage.—There is no safe anchorage around any of these islands; in the progress of the survey H.M.S. *Nassau* anchored in 6 fathoms, south of Manuk Manukan, and 70 fathoms over the stern.

Coral reef.—Two and a quarter miles north-west of Manuk Manukan is a patch of 2¼ fathoms, which is considered to be connected with Manuk Manukan by shoal ground, and therefore to be avoided.

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* Clotilde breaker, reported in 1859 to be in lat. 8° 8¼′ N., long. 119° 16′ E., is considered to be identical with Mœander reef.

The West Bank is 4 miles to the westward of Manuk Manukan, and runs about N.N.W. and S.S.E. 3¾ miles long. The least water found was 6½ fathoms, near the south end.

The S.W. Bank.—The eastern extreme of this extensive bank lies S.W. ½ S. 4¾ miles from Manuk Manukan ; from this extreme the bank extends to the westward 3¼ miles, and thence to the north-west 5 miles, the general direction being E.S.E. and W.N.W. about 8 miles. The least water, 9 fathoms, was found on its south and east extremes.

The bottom is even, generally coral and sand, and may be clearly seen, in 13 to 17 fathoms. H.M.S. *Nassau* anchored on this bank on several occasions in good holding ground. From the eastern part of the bank, the summit of Kagayan Sulu can be seen in clear weather bearing S. by E. ¼ E., 38 miles distant.

Java reef.—This dangerous reef, with only 15 feet, lies N.N.E.¼ E., about 5 miles from the peak of Bankawan ; the five-fathoms limit around this reef extends N.N.E. and S.S.W. 1⅓ miles.

In daylight it may be passed pretty close, as the discoloured water is marked, and there are strong tide ripplings round the shoal ground. A clear channel exists on either side of this reef.

A good clearing mark, if working on its parallel to the northward and eastward, is not to open the small islet north of Bankawan, to the westward of that island.

Memnon shoal, reported as having been passed over by the British steamship *Memnon* in 1889, lies about 25 miles northward of Kagayan Sulu. It consists of coral and sand and has an estimated width of about one mile; the least depth obtained was 6 fathoms, but it appeared to be shoaler in other places.

Position as given, to be considered approximate, lat. 7° 27½′ N., long. 118° 24½′ E.

Valparaiso shoal, on the north-east part of which the German vessel *Valparaiso* obtained soundings of 6 and 7 fathoms, the bottom of coral being clearly seen, is stated to be about 2 miles in extent, with apparently shoaler water to the south-westward. Its approximate position is 7 to 8 miles north-west of Bankawan islet, in lat. 7° 52′ N., long. 118° 27′ E.

Viola reef, a coral patch having only 4 feet at low-water spring tides, and on which the Spanish vessel *Viola* struck and remained several hours, is reported as lying in latitude 7° 50′ N. and longitude 117° 40′ 50″ E. This position was searched by H.M.S. *Nassau* in 1872 without success. A danger, position doubtful, is now shown on the chart 4 miles north of it.

KAGAYAN SULU GROUP,[*] in the south-western part of the Sulu sea, forms a dependency of the Sultan of Sulu, and includes the island of Kagayan Sulu, the two Muligi islands to the south of it, with Kinapusan, Pomelikan, Bintut, Bisu Bohan, Bohan, Mandah, and Lapun Lapun to the north ; Kagayan Sulu alone is inhabited, the smaller islands being alone resorted to for temporary purposes, such as turtle catching.

Kagayan Sulu, the largest of the group, extends about 8 miles in an east and west and 5 miles in a north and south direction, and (with the exception of the north-west and south-east points, which are steep-to) is fringed by a coral reef extending in some places nearly three-quarters of a mile from the shore ; this reef dries in patches at low water, with channels for canoes or rafts between the edge of the reef and coast of the island.

In the interior of the island are ranges of hills attaining a height of 1,105 feet on the east side, and sloping gradually to the sea.

It appears thinly populated ; the soil and climate are favourable to vegetation, and the cultivation of tobacco, sugar-cane, hemp-palm, yams, bananas, and a variety of fruits and vegetables ; but the natives are indolent, and depend chiefly for their subsistence on fish and rice imported from Paláwan, for which they exchange coco-nuts and coco-nut oil.

A bank, about half a mile in diameter, with a least depth of 9 fathoms on it, and 22 fathoms close around, has been reported by H.M.S. *Wanderer* to lie situated with the highest peak of Kagayan Sulu (mount Ledan) bearing S.E. by E. ½ E., distant about 30 miles.

Supplies.—There are small horses and bullocks on the island, and the latter with a few fowls constitute the live stock, for which exorbitant prices are demanded.

Water at half tide may be obtained from a spring at the landing-place near the south-west anchorage, and at the watering place inside the crater lake on the south side of the island.

Anchorages.—The best anchorage during the north-east monsoon is on the west side of the island, with Tanjong Tavo Tavo bearing N. ¾ W. about one mile distant, and a remarkable tree on the south-west point bearing S.E. by E. ¾ E. about 1⅓ miles, in from 9 to

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[*] *See* **Admiralty chart, Kagayan Sulu and adjacent islands; No. 929, scale, *m* = 1·0 inch.**

11 fathoms, sand and coral. During this monsoon a swell sets in occasionally round Tanjong Tavo Tavo, causing an unpleasant rolling motion, and interrupting the communication with the shore, the sea breaking along the entire edge of the reef.

There is anchorage on the south side of the island off the two remarkable crater basins, in 10 fathoms, sand, with Tanjong Tandotao, the south-east point bearing E. by N., and Green islet, at the entrance of the western crater, N.W. ¾ N., distant about one mile.

There is no anchorage on the north side of the island unless in deep water, but this side may be approached safely within a mile, and there is a good channel between it and Mandah, taking care to avoid the rock that dries to the E.N.E. of Lapun Lapun.

Tides.—At Kagayan Sulu, during the north-east monsoon, it is high water, full and change, at 6h. 10m., springs rising 6 feet; the tides are, however, irregular and uncertain, the tidal stream being scarcely perceptible.

Kinapusan, 311 feet high, and the northernmost of the Kagayan Sulu group, lies E.N.E. and W.S.W., a little more than half a mile long; it is surrounded by a coral reef, which on the south side extends nearly one-third of a mile from the shore.

To the north and east of the island the water is deep, but on the south and west sides the 20-fathom line of soundings extends nearly 2 miles.

Fair anchorage will be found on the south-west side of the island, in from 7 to 10 fathoms, coral and sand, with Kinapusan summit N.E. ½ N., and Pomelikan summit S.S.E. ½ E.

N.E. bank, the 10-fathom limit of which includes a circular space of about one mile in diameter, and with only 4 fathoms on its shoalest part, lies N.E. by E. about 3½ miles from Kinapusan; the shoal is coral and sand, with deep water between it and the island.

This bank is not steep-to, as the soundings decrease regularly from 20 fathoms to 5, forming a fair anchorage or stopping place on either edge of the shoal. Tanjong Tavo Tavo in line with the west point of Bohan S. by W. ¾ W. clears it to the eastward, and Pomelikan kept just open of Tanjong Tavo Tavo clears it to the westward.

N.W. bank, the inner 4-fathom patch of which is N. W. ½ W. 3½ miles from Kinapusan, runs in a north-west and south-east direction, one mile long, and about one-third of a mile broad; it is of the same character as the North-east bank, but is more steep-to, and vessels should not anchor on it.

The west point of Bohan in line with west point of Pomelikan

S. by E. ¾ E. clears it to the eastward; and the west point of Pomelikan in line with west end of Mandah bearing S.E. ¾ S. clears it to the westward.

Bohan and Mandah.—Between Bisu Bintut and Bisu Bohan there is a safe channel, but Bisu Bohan, Bohan, and Mandah are connected by a reef dry at low water. All these islands, with the exception of Bintut, are thickly wooded, Mandah having a sharp peak 283 feet high. Bintut appears a vast block of dark sandstone.

There is a good channel between Pomelikan and Bintut, but the latter island should be kept aboard, as a reef runs off Pomelikan to the southward and westward about 3 cables.

Muligi islands.—These two islands are 410 and 232 feet above the sea, the southern and larger island being about half a mile long north and south, and one-third of a mile broad; they lie 8 miles to the southward of Tanjong Tavo Tavo, with a clear channel 5 miles wide between them and Kagayan Sulu.

These islanda are uninhabited, but the natives resort to them to fish.

A reef extends 2 cables to the north-east of the south Muligi island, narrowing the channel between the islands considerably; the channel, though clear, should not be attempted.

Willcox bank.—H.M.S. *Growlcr*, 1877, when proceeding between Kagayan Sulu and Muligi islands, passed over a coral shoal near the centre of the channel, the least water obtained was 6¾ fathoms, the bottom, however, was distinctly visible. There are 23 to 26 fathoms a short distance northward, and 55 to 65 fathoms within 1½ miles southward of this shoal.

From the shoal South Muligi island bears S.W, by W. westerly 4½ miles, and Tanjong Tavo Tavo, west extreme of Kagayan Sulu, N.N.W. ¾ W. westerly 7 miles.

Coral shoal.—A coral patch of 3 fathoms has been reported by a German steam vessel as lying 30 miles south-eastward of Kagayan Sulu, in lat. 6° 39′ N., long. 118° 57′ 30″ E.

The island Mambahenauhan, lying in lat. 6° 33½′ N., long. 118° 31½′ E., is high, of brown rock, with brushwood and small trees on the summit. The chart shows a sounding of 3 fathoms in lat. 6° 39′ N., long 118° 57′ E., but there is no further information about it.

Pudsey Dawson dangers and Muligi patches are described in chapter IV.

BASILAN STRAIT,* open from west to east, separates the south coast of Mindanao from Basilan island; it is 8 miles wide and 24 miles long. The Santa Cruz islands and banks, situated on the Mindanao side, divide it into two deep channels, both equally navigable: the northern channel, although the narrowest, is generally preferred, as it offers the advantage of anchorage on the coast of Mindanao in case of a calm, the vessel thus avoiding being carried away by the current.

Caldera bay and port lie to the eastward of the point of that name on the south coast of Mindanao. There is anchorage in the bay in 7 to 9 fathoms, sand. The inner port of Caldera can only hold four or five vessels of 6 feet draught: the entrance channel is only 73 yards wide and 12 feet deep.

Coast.—From point Caldera the coast runs 7 miles S.E. to point Caballo, west of the town of Samboanga; it consists of sand beaches with some strong bluffs, and is steep, low, and wooded. Vessels can anchor if necessary in front of the town of San Mateo, on a bank of sand, in 15 to 8 fathoms; but elsewhere along this part of the coast the bottom is foul and uneven.

SAMBOANGA, the principal town of Mindanao, situated on the south-west extreme of the island, is a small town of some importance. It contains a cathedral, a fort, and a public hospital: the population in 1879 amounted to 6,300 persons. The settlement dates from the year 1635, when the necessity was recognised of establishing a military post in the centre of the hostile district, as a base of operations against the Moros and pirates.

Anchorage.—The anchorage is not good; the narrow bank that forms it is very steep, and, outside a depth of 12 fathoms, the bottom is hard and uneven, and many ships have lost their anchors there. An excellent mark for the edge of the bank (immediately in front of the town) is the extremity of Tiktauan island in line with Mariki point; outside this line the water is deep; when upon it the soundings vary from 10 to 13 fathoms, whilst inside it the water shoals rapidly. A very good berth is in 10 fathoms, with the lighthouse N. by W., and the right extremity of Tiktauan island in line with Mariki point S. 71° E., as above.

Beacons.—Three beacons mark the edge of the shoal water. They consist of tripods carrying a red ball at the top. The first one is placed 328 yards south-west of the head of the mole; the second is 328 yards south-east, and the third 547 yards S.E. ¼ E. of the head of the mole. The depth of water in which these beacons are placed is from 11 to 15 feet.

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* *See* Admiralty chart, Basilan strait, No. 961; scale, $m = 1$ inch.

Vessels intending to remain at Samboanga more than 24 hours should moor, as it is almost impossible to keep a clear anchor owing to the strong tide and frequent calms. It is advisable to run the cable out with the head inshore, letting go the second anchor in 7 fathoms; under these directions the vessel would not ground, or, even if she swung stern in, be endangered, as the currents and eddies have an off-shore set, and in weighing the inshore anchor, which should be first lifted, the current will only cause the vessel to ride along-shore.

This road is very much exposed to the gales from west and south-west; a heavy sea sets in with these gales, and is increased when the flood stream makes against the wind. Four ships at one time were totally wrecked by a sudden and heavy south-west gale at this anchorage, the cables having either parted or the anchors dragged.

On the first appearance of a south-westerly gale vessels now slip from Samboanga, and if possible run inside Tiktauan island, to the anchorage off Vilavilan island, which is in 7 fathoms, mud, and affords good holding ground. The approach of these storms is generally foretold by the coast of Basilan being hidden by masses of flying clouds, and the Sangboi islands being lost to view; and if at the same time it should be cloudy, dark, and threatening to the north-west, bad weather is certain, the wind beginning generally to blow from the north-west, and backing until it settles from the south-west. The cause appears to be a typhoon passing to the northward.

During the north-east monsoon the road is sheltered and the water smooth.

LIGHT.—A fixed *red* light is shown from the end of the mole; it is elevated 25 feet above the sea, and 20 feet above the ground and should be visible from a distance of 5 miles.

Supplies.—Provisions can be obtained at Samboanga at a moderate price; it is necessary to order them the day before to ensure the supply. Meat and poultry, especially, are cheap.

Water can be procured from the stream that runs through the town, but as during the day the natives wash themselves and their clothes throughout its course several miles inland, it is necessary to obtain it early in the morning before they begin. It should also be filtered to free it from any vegetable matter and earth, especially after heavy rain.

Coal.—No coal is stored at Samboanga; the depôt is at port Isabela and is only for the use of the Spanish squadron; supplies, therefore can only be had by the courtesy of the officer commanding at Samboanga.

Mails.—There are regular and frequent steamers to Manila: once a fortnight *viâ* Sulu and Palawan, and once a fortnight *viâ* Iloilo.

Tides.*—At Samboanga there are generally two tides in the lunar day; but at equinoctial quarterings, and when the moon has high declination, there is but one tide. The time of high water at full and change is 6 h. 54 m., and springs rise 4 feet. The same phenomenon is observed here as in the China sea, viz., the highest tide follows the moon's superior transit when she has southern declination, and the inferior transit when she has northern declination.

In Basilan strait the tide streams follow the direction of the channel, and near the islands and shoals they follow the edge of the reefs; the flood stream setting to the westward and the ebb to the eastward, with a velocity of 2 to 3 knots at neaps, and 5 to 6 at springs. The streams have been observed, however, to set in the reverse way in the months of November and December; and sometimes to set in the same direction for 24 hours, generally from west to east, although there have been two high tides and two low tides on the same day. With these exceptional cases the turn of the stream in Samboanga takes place with slight difference at the hours of high and low water.

The turn of the tide takes place later in the strait than at Samboanga. The change begins first on the coast of Mindanao, then in the strait, and last on the coast of Basilan.

Winds.—In the vicinity of Samboanga the winds which prevail during the different months of the year are: in January, from east and north-east, with clear weather; in February, March, and April, the same winds with occasional breezes from north-west of short duration. In May and June it blows from south-east, and is variable; but in June there are squalls, and at the end of the month fresh breezes from the south-west. In July, August, and September it blows from south-west with more or less force, and much rain and foul weather; when a gale occurs it generally does not last more than three or four days. In November and December it blows from the north and north-east, and then the monsoon becomes steady.

Throughout the year, when the seasonal wind is not strong the land breeze blows during the night, sometimes freshly.

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* *See* Appendix.

Santa Cruz bank and islands.—This coral bank, the northern edge of which is distant 1½ miles from the coast of Mindanao, extends 8 miles in a direction parallel to the coast with a general width of 2 miles. The shoalest water, 1 to 4 fathoms, is distributed in patches along the outline leaving passages to the interior of the bank, the depth over which ranges from 8 to 12 fathoms.

Great Santa Cruz island on the eastern part of the bank, is 1⅓ miles long, and 9 cables wide; it is low, wooded, and surrounded by a narrow reef with 6 to 8 fathoms water at the edge.

Little Santa Cruz island, also low and wooded, lies on the northern edge, south-west of the longer island. It is 8 cables long east and west, and one cable wide, and each end is prolonged by a reef which dries at low water springs, to the distance of half a mile, shoal water of 2 fathoms extending from the western reef to a distance of 1½ miles from the island.

The Great Bank extends to 4½ miles west by north of the Great island, but the most dangerous part is W. ½ S. of the island where there is as little as 2 feet water, on a continuation of a line from half way between the fort and cemetery of Samboanga to the eastern end of the small island. Two shoals of 2 and 2½ fathoms lie respectively N. ½ E. and N.E. about three-quarters of a mile from the eastern point of Great island. President shoal, with 2½ to 5 fathoms water on it, extends from three-quarters of a mile S.S.W. ¾ W. to 1½ miles E. by S. ½ S. of the same point.

Clearing marks.—The light on the mole bearing N.N.W. ½ W. clears the eastern part of President shoal in 5 fathoms, and the light bearing E. ¼ N. clears the northern part of Little bank. Point Caldera, bearing N. by W. clears the western part of Great bank in 5 fathoms. Little Santa Cruz island bearing W. by N. clears the patches N.E. of Great island in 6 fathoms.

Luzon reef, a coral reef on which the *Luzon* touched in 1889, is reported to have 3½ fathoms over it, and to lie as follows:—Samboanga just open to the eastward of Great Santa Cruz island; north end of Lanhil island—East.

COAST.—From Samboanga the coast runs 2½ miles E. by S. ½ S. to point Mariki, and thence E.N.E. towards port Masingluk; soundings of 4 fathoms extend to half a mile S.E. of point Mariki.

Tiktauan island is 2½ miles in extent E.N.E and W.S.W., and is low and wooded; a reef covered by 2 to 5 fathoms extends a quarter of a mile to the S.W. and S., and half a mile to the N.E. of the island, shoal water, with less than 2 fathoms continuing to 1¾ miles in that direction. Tiktauan is separated from the coast by a channel half a mile wide and 10 fathoms deep, offering good anchorage if required. A reef of sand and coral 4 cables long and 50 yards wide extends N.W. by W. from the island towards the middle of the channel, and is generally marked by tide rips. From this reef the following bearings were taken: the southernmost of the Sakol group in line with the middle of mount Tulnalutan; the south extreme of Mindanao in line with the northern part of Great Santa Cruz island; and the *cogonal* of Pulunbato in line with a notable group of trees. The extremity of the reef is 3 cables N.N.W. of the most prominent point of Tiktauan in the channel.

Masingluk river and anchorage.—To the north of Tiktauan channel, and at 3½ miles from point Mariki a narrow inlet runs up 2½ miles to the W.N.W. with several rivers flowing into it. The island Vilavilan divides this inlet into two arms, the southernmost of which is 3 to 4 fathoms deep and navigable, and is the outlet of the Masingluk river. The anchorage is in mid-channel between Vilavilan and the southern Sakol island in 6½ to 12 fathoms, completely sheltered from wind and sea, and vessels take refuge here during bad weather in the S.W. monsoon.

Tides.—The flood stream sets to the S.W. and the ebb to the N.E. at the same hours as at Samboanga.

Sakol island, N.E. of Tiktauan, is separated from Mindanao by a navigable channel, partly obstructed in the northern end by coral banks, with passages half a mile wide and 7 fathoms deep between them and the coast of Sakol and Mindanao. The north-eastern part of the island rises to 755 feet above the sea, and a narrow reef of coral fringes the whole of it.

Roldan shoal lying 2 miles N.N.E. of the north part of Sakol, is small, and covered by 5 feet least depth, with 5½ to 11 fathoms around it.

Tulnalutan is a small island 269 feet high, lying 3½ miles east of the east point of Sakol.

Angosto shoal (Samar), bearing E. by N. ½ N. 4 miles from the peak of Tulnalutan, is of sand and coral, half a mile in diameter, with 2¼ fathoms least water on it. The best marks for this shoal are the north point of Tulnalutan in line with the south hill of Sakol and point Matanal one degree east of Lanhil island.

Three-fathom shoal is a small shoal of sand and rock before the entrance of Sibuguei bay, covered by 2¾ fathoms water, which bears E.N.E. 11 miles from Tulnalutan.

Sinonog is a small island lying 2½ miles east of Sakol, and surrounded by a reef which extends a third of a mile to the E.N.E. with 9 to 17 fathoms at the edge.

Malanipa island, south of Sakol and on the north side of the eastern entry of Basilan strait is 394 feet high, and has on its eastern coast a small islet surrounded by a reef.*

From the west side of Malanipa a bank of fine sand covered by 2 to 9 fathoms, extends 4¾ miles to the westward, and is half a mile wide near Malanipa, but very narrow to the westward. From the western end, in 5½ fathoms, Coco island bears S.S.E. ¼ E.

Coco island, 4½ miles from the coast of Basilan is clean and steep-to; it is one mile long N.W. and S.E., 490 feet high, and wooded: a small islet lies a third of a mile to the N.W. of it. †

Sibago island, 7½ miles E. ½ N. of Coco island is 1¼ miles long N.W. and S.E. and three-quarters of a mile wide; a hill on the eastern side rises to a height of 735 feet, but the coast is low.

Lanhil island, 1¼ miles to the N.W. of Sibago is 1⅓ miles long E.N.E. and W.S.W., and 558 feet high, with a low shore like Sibago, terminating to the northward in a reef which dries at about 2 cables out. These two islands seen in certain directions appear as one saddle-shaped island; both are clean, with generally soundings of 5½ to 7 fathoms at one cable's distance, from the shore, and 23 fathoms in the channel that separates them.

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* A bank of coral has been reported to lie half a mile N.E. of Malanipa, extending half a mile from north to south, and covered by about 2 fathoms, but no soundings were taken: its position is doubtful (Paris, Annonce Hydrog. No. 46 of 1882), and it does not appear on the Spanish chart of 1888.

† Elena bank, reported in 1847 as situated 1½ miles N.E. of Coco, has been searched for without success by the Spanish surveyors, and is now removed from the chart.

CHAPTER III.

SULU ARCHIPELAGO.

Variation in Basilan Strait - - 1° 55′ East in 1890.
„ in Sibuko bay - - 2° 10′ East in 1890.

THE SULU ARCHIPELAGO consists of a long chain of islands extending more than 180 miles from the south-western extremity of Mindanao, to the north-eastern extremity of Borneo, and includes over 150 islands of various sizes. It is divided into three principal groups:—that of Basilan to the eastward; Sulu, from which the name is derived, in the centre; and Tawi Tawi to the westward. Besides these, there are smaller groups, the description of which is included in that of the three larger groups.

BASILAN GROUP.[*]—**Basilan island,** which with the south-west end of Mindanao, forms the strait of Basilan, is the largest and principal of the group. The island is thickly wooded, and is traversed by high mountain ranges which are frequently enveloped in clouds. The highest peak, lying somewhat to the southward of the centre, attains a height of 3,394. The shores of the island, which are low and wooded on nearly all sides, are girt by a belt of sand and coral debris from 50 to 100 yards wide. This belt is sometimes covered at high tides, and forms Mangrove swamps.

There are many rivers, but they are of small extent: their mouths are wide and can be entered by boats at high water, but a short distance up the width contracts until the river becomes a mere rivulet, flowing among stones. Good watering places do not exist, as fallen trees intercept the passage of boats.

Navigation round the island presents no difficulties: the water is clear, and the bottom can be seen at a depth of 8 to 10 fathoms; as the weather is generally fine, vessels can anchor anywhere round the coast on coral bottom.

The inhabitants of Basilan, a scanty population, are of the same race, and speak the same language as the other inhabitants of the Sulu islands; that is a language partaking more of the Philippine than the Malay character, and much intermixed with the Bisaya, one of the most prevailing languages of the Philippine archipelago. Basilan, having long enjoyed the bad reputation of being a nest of thieves and pirates of the neighbouring islands, the boldest and most expert of the Archipelago, was taken possession of and garrisoned by the Spanish Government in 1848, and annexed to the province of Samboanga in Mindanao.*

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[*] *See* Admiralty chart:—Sulu Archipelago, No. 928; scale, $m = 0{\cdot}16$ of an inch.

PORT ISABELA† is on the north-west side of the island. The roadstead is between the islands Malamaui and Lampinigan, and offers good anchorage in 6 to 16 fathoms, mud. Port Isabela is in the channel between Malamaui island and the main island, Basilan. It contains the southern Spanish naval station and arsenal for the equipment and repair of small vessels, and is an excellent harbour accessible to vessels of all sizes.

Malamaui island is 538 feet high, and thickly wooded. The timber is considered to be superior to any found in the neighbourhood, and is well adapted for spars and for building ; it consists of molavi, a hard yellow wood, poon, palo maria or bitanhal (one of the Guttiferæ or Gamboge family), and mangrove.

Lampinigan is about 200 feet high, with two remarkable trees on the summit.

Dangers.—Pamilukan bank, the shallowest part of this bank, having over it 2¼ to 5 fathoms, lies 2 miles west of the western part of Malamaui, and 2½ miles N.E. of the summit of Lampinigan, the remainder of the bank has 8 to 17 fathoms. A long bank north-west of Lampinigan stretches east and west for 4 miles, and has two patches of 4¼ fathoms on it, situated respectively N. 17 W. 1¾ miles, and N. 59 W. 2 miles from the summit of Lampinigan. There are besides these several banks to the north-west of Malamaui, on which the least water shown on the chart is 7 to 8 fathoms.

Directions.—The port of Isabela can be entered from the north or south, and there is sufficient depth of water for large vessels. The channel is 4 miles long, and has an average width of 1½ cables. The mangroves on each side grow to the water's edge, and the shoals which narrow it in places, as well as the reef at the southern entrance, are marked by beacons ; these beacons consist of a staff with a ball on it, the balls being coloured black on the Malamaui side of the channel, and white on the Basilan side. Vessels generally take the entrance which will bring the tide against them in order to avoid turning in the channel.

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* Crawford's Descriptive Dictionary of the Indian islands.

† *See* Admiralty chart, Basilan channel, No. 961 ; scale, $m = 1{\cdot}0$ inch.

In entering from the northward the only precaution necessary is to avoid a shoal covered by 3 feet of water, lying 2½ cables from the Basilan shore, and not to close Malamaui island within one cable until the channel is entered. Inside the channel the chart shows a shoal of 2¾ fathoms at one cable from the Basilan shore; a rock with 2 fathoms on it near Kulat island; another shoal with one fathom on it at the entrance of a creek on the Basilan shore, half a mile from Kulat; and near the middle of the channel on the Basilan side, a shelf of coral level with the surface, having its northern extremity 7 cables N.E. of the hospital in the river Pasahan; but nearly everywhere the shores of the channel can be passed close to the mangroves.

The shoal on which the hospital stands is marked by two beacons, one to the eastward in 3 feet water to indicate the passage between the shoal and the naval station, and the other to the westward in 16 feet water as a guide to vessels manœuvring. A Spanish Hydrographical Notice (No. 127 of 1887) says that "A beacon has been placed in 16 feet beyond the town of La Isabela at the beginning of the mangroves; vessels turning must not go within the line between this beacon and the mole, or the houses in the town"—but the notice does not say whether the beacon is N.E. or S.W. of the town.

Western entrance.—Moro island is low but covered with trees 50 to 65 feet above the water, and visible at a distance of 7 miles. At 1½ cables E.S.E. of this islet there is an extensive reef awash, nearly always covered by driftwood, and well marked by the ripple round the edges; part of the sand is always above water, and mangrove bushes are beginning to grow there. This shoal is now (1887) marked by two beacons, one at the western edge, one at the eastern edge. The beacons are wooden piles with a cone of canes. The depth of water off the eastern edge of this bank is decreasing towards the coast.

At 1½ cables W. by S. of Moro island there is a small shoal covered by 2¾ fathoms. The channel on either side of the island may be taken, but that on the north of the island and south of Malamaui has the greater depth of water.

The naval establishment of Isabela is on the south side of the channel at the entrance of the river Pasahan. It is the residence of the Governor of Basilan, and numbers about 6,000 inhabitants. A fort 65 feet above the sea, commanding both entrances of the channel, is at a little distance south of the establishment, and at its eastern part are the barracks. There is a small store and repairing yard, with workshops for machinery, and a slip capable of hauling up a gunboat of 200 tons. A wooden hospital was erected in 1885 on piles over the reef at the entrance of Pasahan river.

Coal.—There are coal sheds capable of storing 2,000 tons on the island of Malamui, opposite the naval establishment. The coal is kept for the use of the Spanish squadron in Sulu, and can only be obtained by permission of the officer commanding at Samboanga. The only means of coaling is a wooden jetty, with a depth of 3 fathoms off the end. The jetty is in a little bight of the shore out of the force of the tide, but it is too slight to lash a ship to ; vessels must therefore anchor in the stream, and haul in by hawsers to boulders ashore. There are no bollards to secure by. It is advisable to have an anchor out from the stern as well as from the bow. No coolies are procurable, and vessels must coal with their own crew.

Water may be obtained in small quantity at the settlement, but if in the outer road it is more convenient to procure it from the river Gumalarang, in San Raphael bay, on the south shore.

Tides.—In port Isabela a single tide a day occurs more often than two tides. It is high water, full and change, at 8h. 18m. ; springs rise 2 feet ; age of the tide 24 hours. The tide-stream does not turn at high and low water ; the flood-tide sets to the S.W., and the ebb to the N.E. ; the velocity is 1½ to 2 knots, but is said to reach 4 knots at the solstices.*

COAST.—The west and south coasts of Basilan are high, wooded, and steep-to, and can be navigated at a distance of one mile with the help of the chart. On the western side, near point Pangasahan, there is a small islet, separated from the coast by a channel 1½ cables wide, and 6 fathoms deep, in which small craft can enter.

Malusa bay.†—This anchorage, on the west side of Basilan island, is formed by two islands : Great Govenen, which is conical in shape, and 308 feet high, and Little Govenen, also conical, but only 59 feet high. A shoal of 3¾ fathoms lies N.N.E., one cable from Great Govenen. Good anchorage and holding ground will be found with the northern point of the island north of Teipono bearing W. by S. ½ S., and the extreme point of Pangasahan N. by W. ½ W. A river enters at the head of the bay, the bar of which dries at low water, but within the bar the depth is 9 feet, and the river is just wide enough for a boat to pull up.

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* *See* Appendix

† *See* Admiralty plan, Malusa bay, No. 927 ; scale, $m = 1{\cdot}95$ inches.

As water is the only supply to be obtained, a ship, unless well armed, would do well to avoid Malusa bay, the natives having committed frequent acts of piracy.

ISLANDS WEST of MALUSA BAY.—Teingolan, Taikéla Dauan, and the two Langasmati islands are flat and covered by vegetation; the channels between them are clear, except between Teingolan and Taikéla, where there is a coral shoal of 2¾ to 4¾ fathoms, which leaves a channel of 7 cables width between the shoal and Taikéla. The chart shows two small shoals of one and 1½ fathoms off the north of Taikéla.

In 1871 H.M.S. *Nassau* took the track between Dauan and Langasmati islands, and from thence to the north of Taikéla island, and up the coast of Basilan; but great caution is required, as the tides are strong and irregular.

Teipono is small, low, and wooded; the chart shows a coral reef projecting to one cable from its northern end, and a detached patch of one fathom at a cable's distance from its eastern side. The channel between these islands is 6 cables wide and 15 fathoms deep in the middle.

Tides.—The maximum rise and fall only amounts to 5 feet, but the velocity of the tidal stream in the channel between the coast of Basilan and the islands Teinga Lakit and Teingolan is very strong, and reaches 3 knots at times; the flood stream sets to the N.W., and the ebb to the S.E.

SOUTH COAST of BASILAN.—Some small islets border the coast between Malusa bay and point Manghal, the southern extremity of Basilan. Point Manghal is low and sandy; point Tumajuban has a little hill on it; at one mile S.E. of point Tumajuban is the edge of the bank with 6½ fathoms on it, and no bottom with 60 fathoms at less than a cable from it. Kauluan island, off the south-east point of Basilan, is low; it is separated from Basilan by a narrow channel with several small shoals at its northern end. The soundings on its south-east side appear to be very deep, as no bottom could be obtained with 60 fathoms within 1½ cables of it.

Point Matanal.—In the large bay between Kauluan island and point Matalan, the eastern point of Basilan, the depths decrease from 20 to 10 fathoms towards the shore; coarse sand and rotten coral, favourable for anchoring to wait a tide.* The land above the point rises to a mountain 2,136 feet above the sea.

The north-east shore is bold-to. Coco island and Sibago are described with Basilan strait.

SANGBOI GROUP.—Teinga island, the northernmost of the archipelago, is small, low and wooded, and is fringed by a reef. The bank of 5 to 11 fathoms, on which the group is situated, extends to a distance of about 5 miles E.N.E. of Teinga. It is probable that the 6-fathom bank passed over by the *Wild Rover* in 1870 is one of the patches of this bank, as the position assigned by that ship has been thoroughly searched by the Spanish surveyors in 1885. The Spanish Derrotero mentions a sounding of 6 fathoms at 7 miles W. ½ N. of Teinga; this is not shown on the English charts.

Sangboi islands, or Hare's Ears, are two remarkable islands, 841 and 585 feet high, and may often be clearly seen when the high land of Basilan is obscured by clouds. The mountain of the southern island resembles a cupola, while the land round it is low. A shoal of 2 fathoms is shown on the chart at 2 miles S. ½ E. of the southern end of the southern island.

Kaludlud and **Dassalan** are low and said to have good timber. A shoal of 2½ fathoms extends as far as 2 miles to the westward of Kaludlud; and Griffin rocks, covered by 1½ fathoms, lie 2¾ miles to the westward of the same island. These rocks require a good look-out, as they do not always break. Besides these dangers, and a patch of 2 fathoms lying E.S.E. 2 miles from the south points of Dassalan, the chart shows many shoal patches about these islands.

Salkulakit islet, and the two rocks Lakit, are on the southern edge of the Sangboi bank. To the north and north-west of Salkulakit, and to a distance of 4 miles from it, there are several soundings of 3¼ to 4¾ fathoms, and there may be dangers not yet discovered.

Favorite bank has not been sounded out: the *Nassau* in 1871 carried a depth of from 6 to 10 fathoms for 8 miles over it.

Clearing mark.—If bound south, Mount Baku summit, in Sulu island, bearing S. ¾ W., crosses the bank in not less than 18 fathoms; the shoaler water being about 5 miles to the westward of that line.

Pilas is the largest of the islands near Basilan; it has a population of Moros; and water can be obtained there from wells, but not very good. The land is low and flat, except to the northward, where there are two hills close together, 918 and 522 feet high. On the east side is the little island Tagutu. On the western side there are several small islands with good anchorages between them, especially one on the north-west part of Pilas; but a good local pilot is necessary for entering it, particularly if the northern entrance be taken, as the islets have reefs off them, and one very dangerous one must be passed close to in order to clear the reef on the north-west coast of Pilas, as well as Taniela shoal, not named on the chart, on which, at half a mile from the shore, there is a rock above high water, surrounded by depths of 5 fathoms.*

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* Horsburgh, Vol. II., 8th edition, p. 568.

Coral patches.—A patch, covered by 2 fathoms lies S.W. ½ S., 3 miles from the south point of Tiguilabun, which is an extension of Pilas island; another of the same depth lies S.W. by W. ½ W. 4¾ miles from the same point.

Mindoro shoal, or Batu Batu of 2¾ fathoms lies W. ½ N. 10 miles also from the same point.

Takut Pabunuan, included in the Sulu group in the Spanish Derrotero, is a bank of sand and shells lying 18 miles W.N.W. from the Western Bolod island, and 20 miles north of Sulu island. It is 4 miles in extent from north to south, and about 2 miles across from east to west. The general depth over it is 4¾ to 6 fathoms, but in the middle there is a ridge of 4½ fathoms with two patches of 2¾ and 2 fathoms. From the position of least depth in 2 fathoms the following bearings were taken: the summit of Gunjangan island S. 5° W., the hill 1,227 feet high on the eastern point of Sulu island S. 19° E., and the south part of Kabukan island S. 56° W.

Halcon rock, or Wilhelmina reef, lying 6½ miles N.E. of the 2-fathoms patch on Takut Pabunuan is awash at high water, steep-to, and surrounded by depths of 25 to 30 fathoms.

Pilas channel, between Pilas to the west and Baluk and Mataja to the east, has a width of 3 miles and a depth of 14 to 38 fathoms. The tide streams in it attain a velocity of 6 miles at springs; the flood stream sets to the north, and the ebb to the south.

Baluk island rises to a peak 525 feet high on the northern part: the southern part is low. The chart shows a shoal round the northern part to a distance of 1½ cables.

Mataja island is low, flat and wooded; it is steep-to on all sides except the northern. Mataja bank, between the islands Mataja and Baluk, has 1½ fathoms on it.

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* This rock is not shown on the Spanish chart of 1887.

Teinga Lakit and Odel are small, low, and wooded; from Teinga Lakit a reef projects 6 cables N. by W.

Dauan and Langasmati are described among the islands West of Malusa bay above.

Tamuk is about 180 feet high; the channel between it and Basilan is clear. The islet Kankuman, one mile E.S.E. of Tamuk, is clean.

TAPIANTANA GROUP.—Tapiantana island, lying 5½ miles south of the south point of Basilan, has on its western side a hill which rises gently to a point of 938 feet above the sea; the eastern part is low, and ends in an extensive reef which dries at a distance of nearly 1½ miles to the eastward. The southern edge of the reef is wooded, and is very steep, the chart showing no bottom with 55 fathoms at a distance of one cable from the trees. The western side of the island is inhabited.

Bubuan, 1½ miles to the northward, has the same appearance as Tapiantana with a hill 794 feet high. In the channel between the two islands there is a shoal with less than a fathom over it.

Salupin and Timbungan are two low wooded islands on one reef at the eastern edge of the bank on which the group is situated; this bank is very steep, the chart showing no bottom with 60 fathoms at little more than a cable to the eastward of the island.

Bilimtinusa is a little low islet, sandy and wooded, less than a mile from the south coast of Basilan; shoal water extends to a distance of 1¾ miles E. by N. of the island at this position, where there are 2¾ fathoms at the edge of the bank: at 2 cables from it there is no bottom at 60 fathoms.

Lanauan island has two hills on it, of 318, and 394 feet respectively; a reef projects a quarter of a mile S.S.E. from its southern end, and at half a mile in the same direction the chart shows a sounding of 2 fathoms. The northern side of the island is inhabited.

Track. — The soundings between Lanauan and Mataja are irregular, from 25 to 40 fathoms; but from 30 to 35 fathoms are the common soundings in the fair track. The bottom is fit for anchorage, consisting of sand and gravel, mixed with coral in some places; near the south side of Tamuk there are coral overfalls, and the depths are less than at 4 or 5 miles distance.

Tides.—The mean tide hour at Tapiantana is 6h. 3m., the maximum rise and fall is 7¾ feet. The tide stream turns at 4h. 15m. after high, and low water. "The tides in the channel south of Tamuk set "nearly N.W. and S.E., the ebb to the S.E. strongest in the S.W. "monsoon, about 2½ and 2 miles an hour on the springs. This "seems also to be the case in the opposite season, for in March we "had the tide setting from 1 to 2 miles an hour to S.E. and only a "short slack when the tide ought to have been running N.W. "Having calms and variable airs at this time we were obliged "frequently to remain at anchor, and were eight days from entering "the Tapiantana channel until we cleared the islands to the N.W. of "Basilan."*

SAMALES GROUP.—Tatalan island, 387 ft. high, lies 4 miles to the westward of the edge of the bank. The channel between Tatalan and Lanauan (called Tapiantama channel) is 6 miles wide, and 11 to 33 fathoms deep; nearly midway between the two islands there is a patch of 7 fathoms. "When the current or ebb "tide is running eastward, a ridge or line of strong ripplings appears "sometimes like breakers, occasioned by the stream falling off the "edge of the bank into deep water. When soundings are got on the "steep edge of the bank, the water shoals immediately to 9 or "10 fathoms, soft bottom; and we found no less in the channel. "In the south side of the channel towards Tatalan, the water is much "deeper, but the bottom there is not so even nor so soft as in the "northern side near Lanauan."*

Dangers.—Batu Mandi is a rock awash with 9 fathoms around it, lying 2 miles to the westward of Tatalan; at 3¼ westward of Batu Mandi lies a narrow bank 2 miles in length north and south, with a least depth of 8 fathoms, sand and rock; midway between this narrow bank and Takut Sungu, the depths are about 20 fathoms; and between the bank and Batu Mandi 22 fathoms.

Caution must be exercised while navigating in the vicinity of these shoals.

Bolod islands are two islands of nearly the same height and appearance; the western Bolod is 643 feet high, and the eastern Bolod 597 feet high. The rock to the northward of this isle is a dangerous little patch of flat rock almost level with the water. The chart shows a shoal of 3¾ fathoms at a distance of one mile S.E. from the eastern Bolod. A bank of sand and rock 1½ miles in extent in a north-east and south-west direction lies with the west Bolod, bearing N.E. ½ E. distant 5¼ miles, and Bitinan island S.S.W. ½ W., distant 8 miles. The chart shows 6 fathoms on this patch.

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* Horsburgh, 8th Edition, Vol. II., p. 570.

Takut Sungu, lying S.E. by E. ½ E. nearly 3 miles from East Bolod, is 2 miles in extent in a north-east and south-west direction, 1¾ miles in breadth, and consists of sand, gravel, and rock. Near its south-west extremity are rocks with a depth of one fathom; at two cables northward of these is a patch of 2½ fathoms, and at half a mile eastward of them is a large patch with depths of from 4 to 5 fathoms, gravel.

There are depths of 8 fathoms close to the southwest side of the bank, 22 fathoms off the south side, and 11 to 13 on the north and north-east sides. From the centre of the bank, East Bolod bears N.W. by W. ½ W., nearly 5 miles.

Buku Tua and **Bulan** are separated by a narrow channel one cable wide and about 10 feet deep. The first of these islands is low, having only a hill of 157 feet on it. Bulan has a round mountain 1,184 feet high on it. At one mile north-east of Bulan are the two islets Dipul: the easternmost, which is the largest, is 249 feet high, and is three-quarters of a mile from the edge of the bank. Mamad islet 1¾ miles to the westward of Buku Tua is 128 feet high, and has no dangers beyond a quarter of a mile from its shore.

The channel between Buku Tua and Tatalan is 2½ miles wide; the soundings in it are mostly from 30 to 50 fathoms.

Tonkil is a low, long crescent shaped island on the south-eastern edge of the bank; at a quarter of a mile from Ton Eguet, the eastern point of the islands, there are no soundings with 55 fathoms line; and at one cable from the southern point, the depth is 90 fathoms. The channel between point Sagui, the western point of the island, and the islands Buku Tua and Bulan, is 3 miles wide. The soundings are 12 fathoms at half a mile south of Bulan, but lessen towards Tonkil, and within the horns of the crescent the depth is under 5 fathoms with many shoaler patches.

Balanguingui islands, consisting of Mamanak, Parol, Tunkalan, Sipak and the principal island Balanguingui with several islets are situated 2 miles west of Tonkil. They are coral islands surrounded by reefs, with narrow channels between them only navigable by the light boats of the Moros.

In 1847 General Claveria destroyed the centre haunt of piracy in Balanguingui, completing the suppression of these pests.

Bangalao, Manungut, and **Simisa,** west of Balanguingui are low. Takut Suligan is a patch of 3 fathoms lying 1¾ miles west of the western point of Balanguingui. Shoal water of 3¾ fathoms extend to one mile S.W. of Bangalao, and 2¼ fathoms to 2 miles north of the same island.

Tidal streams and whirlpools.—Navigation about these islands is dangerous on account of the strong currents and eddies. The Captain of the *Amy Warwick*, who for many years traded from Singapore to the Eastern Archipelago, has stated that at times the tides between Sulu island and Balanguingui run 8 knots with strong eddies and whirlpools. On the flood or N.W. stream, the pool is close under Sipak island, and on the ebb it lies close to the south-east of Simisa, and under Bitinan, of the Sulu group.*

SULU GROUP.—Sulu island, from which the archipelago is named, is about 30 miles long, east and west, and from 5 to 11 miles broad from north to south. The island from east to west is a series of hills and valleys with good cultivation and park-like scenery; the highest mountain being on the west-end, and 2,894 feet above the sea. The coasts, especially the northern, are in general wooded, clean, and steep-to; as also the islands and islets that border them. They are slightly indented and form several bays where there is anchorage; the most sheltered and secure in both monsoons being that of Tulian or Dalrymple on the north side. There is no good watering place in the island: it must either be had from the rivers at low tide, or from wells.

The island has a pleasing appearance; the mountains are covered with magnificent trees, or with beautiful green pasturage: some of them are cultivated to the summit.

"The climate of Sulu, although so near the equator, enjoys a much more even and cooler temperature than that of Mindanao; the nights are sensibly cool, and although the island abounds in water, mosquitos are not troublesome. The Sulu islands are seldom, if ever, visited by gales, although strong winds and heavy falls of rain are not uncommon."†

The population of the island amounted in 1863 to 88,300 souls, scattered through forty-four villages, among which four distinct races may be distinguished: the Guimbajanos are the indigenous race of the island, inhabiting the hill country and employed in agriculture; the slaves are the descendants of captured Bisayans and Malays; the Samales are another group, rude and miserable, in a dependent position although not slaves, living mostly in boats or the marshes in the small islets or "Samales," their occupation being piracy and slave-capturing for the interior; the Moros, proper, enjoying the superiority of the invading race, regulate the commerce and exploit the traffic of others for their own benefit.

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* Remark book of Lieut. Petley, R.N., H.M.S. *Nassau*, 1872.

† Belcher; Voyage of *Samarang*, 1845.

Kapul island, situated at the N.E. extremity of Sulu island, is circular, about 3 miles in diameter and 1,066 feet high on the southern side, clean and steep to on all sides except the S.W. where it is united to Sulu by a bank of sand with 2½ to 4½ fathoms in places. On this bank is the islet Bulicutin.

The Kapul channel between Kapul and Sulu is deep at the eastern end, but has only 1¾ fathoms at the western end.

Goitia shoal, of 1½ cables extent, and covered by 1½ fathoms water, lies one mile N.W. of Kapul.

Bitinan island, to the N.E. of Kapul, and separated from it by a clear channel of one mile width and 13 fathoms depth, is 1½ miles in extent and 720 feet high, clean and steep-to.

Tides.—In the channel between Bitinan and Kapul the tide runs 3 knots.

Dalrymple harbour*, or Port Tulian of the Spanish Derrotero, is formed by the island of Tulian on the north and the coast of Sulu to the south, and being the only well-protected harbour in this fertile island, may at some future day be a place of importance. Good anchorage will be found during the N.E. monsoon under the lee of Tulian island; the natives report that during this monsoon the wind seldom blows home.

Tulian island, about one mile in length from S.S.W. to N.N.E., and 8 cables in an east and west direction, is steep on the west side, running up to a height of 513 feet, the summit being clothed with long grass. The Spaniards had a guard of soldiers on this island for some time, but the natives from the mainland made such frequent excursions, spearing the sentries and cattle, that they found it advisable to remove the settlement, since which time it has not been inhabited.

There are a few fruit trees now running wild, growing on the south and east sides of the island; these with a well are the only traces of the Spanish occupation.

Buol was the largest town in this part of the island of Sulu, but was partially destroyed by the Spaniards in 1872.

From Buol the coast runs to the E.S.E. forming a deep bight, south of Tulian; this bight runs about E. ¾ S., and then trends E.N.E. to Petley point, being covered with mangroves and fronted by a reef with numerous little creeks, mangrove islets, and rocks on it. South of this is the large village of Karang Karang.

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* *See* Admiralty plan:—Harbours in Sulu Archipelago, Dalrymple Harbour, No. 927; scale, $m = 4$ inches.

Dangers.—In the eastern entrance there are two patches of 2¾ fathoms; the westernmost of which lies west 8½ cables from Martin's bluff in Tulian island, and N. by E. of the town of Karang Karang. A bank of 3¼ to 4¼ fathoms lies S.W. 3½ cables from Martin's bluff; a patch of 2 fathoms on a bank of 4¾ fathoms lies 6 cables S.E. by E. ¼ E. of Balseiro point; and in the western entrance there is a 2-fathom patch lying N. by W. 4 cables from Baverstock point.

Anchorage.—A large ship visiting Dalrymple harbour should round Tulian island to the northward, and approach the anchorage by the eastern passage, avoiding the 4½-fathom patch 3½ cables S.W. of Martin's bluff, having passed on the island side of which, a course of about S.W. ½ W. until the southern point bears west, leads up to the anchorage in 8 or 9 fathoms. The extreme eastern point of the island should then bear about N.N.E. ¾ E.

Tides.—From observations taken two days after new moon, 9th May 1872, it appears to be high water, full and change, at Dalrymple harbour at 7h. 50m., springs rise 4 feet.

Coast.—From Buol the coast trends to the westward for 4 miles, and then curving first to the southward and then round to the northward, forms a bay 3½ miles across to point Tuk-Tuk. The bay is bordered by a steep reef, at half a mile from which is Eseo bank, of 2 cables extent, covered by 2 fathoms water, and surrounded by depths of 5 to 7 fathoms. From point Tuk-Tuk the coast trends N.W. for 3 miles to point Igasan (not named on chart), near which is Bankungan island; from thence to point Diangappik, the northern limit of Sulu roadstead, it is clean and steep-to.

The towns Kaduaian, Suok, Bun-bun, and Patikolo on this coast offer no resources; the natives are very poor.

Gunjangan island, 3½ miles N.W. of Tulian, is small, low, and very steep-to; on the eastern side there is an islet obstructed by a shoal.

Bankungan island is of triangular form, and 112 feet high; it is clean and steep-to, except to the N.W., on which side a reef projects 1½ cables, with a rock awash on it. There is a narrow but safe channel with a depth of 7 fathoms between the island and the coast.

Panganaa islet, one mile east of Bankungan, has some rocks close to its southern part; elsewhere it is clean. There is a depth of 13 fathoms between the islet and point Tuk-Tuk.

Sulu roadstead* between points Diangappik and Belan is open to the northward and westward, and when the wind blows fresh from the north-west the Spanish gunboats go to Maimbun road. The coast is clean and consists of coarse sand; the bottom slopes gently, and the 5-fathom line is generally at 2 cables from the shore. A reef about 1½ cables wide, that uncovers in parts at low water, borders the beach before the town, leaving a passage of one foot depth to a lagoon that penetrates to the southward. Two forts command the road.

Anchorage.—The best anchorage is north of the town, in 13 fathoms, with the S.W. angle of fort Alphonso XII. bearing S.E., and point Belan S.W. Anchorage may also be had in 8 to 11 fathoms, white sand, with the largest house, zinc-roofed, just open to the east of the pier, and the remarkable tree on point Mubu to the northward of the town bearing from E. by N. to N.E. by N.

LIGHT.—A fixed *red* light, visible from E. ½ N. to S.S.W. ¾ W., is shown from the north-west face of an octagonal tower of brick, 35 yards to the east of the end of the wooden mole, and 328 yards from the beach; it is elevated 35 feet above the sea, and 33 feet above the ground, and should be seen at a distance of 7 miles.

Tides.—It is high water, full and change, at 7h. 38m.; springs rise 3¾ feet. The flood stream sets to the S.W., and the ebb to the N.E.

Sulu town.—Hardly a trace of the old native town on piles exists now: the Spaniards, who permanently established themselves here in 1878, completely destroyed it, and set to work to build a fortified town which should give them once for all a secure footing on the island. The town is well laid out in three or four streets, planted with rows of bananas and cotton trees on either side, and is surrounded by a wall. An excellent wooden pier runs out for about 360 yards, with the lighthouse at its extremity. The garrison is composed of six companies of a Manila native regiment, under a commandant, and about twenty-five officers. These latter, with their wives and children and sixteen artillerymen, are the only Europeans: they number about 120.†

Imports and **Exports.**—Trade at this place is dull, and in the hands of Chinamen.

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* *See* Admiralty plan:—Sulu Archipelago, No. 927, Sulu roadstead; scale, m=1 inch.

† Cruise of the Marchesa.

The imports are principally rice, hardware, and cotton goods; exports, pearl-shells, pearls, shark's fin, beche de mer, and a small variety of woods.

There is a pearl oyster bed in the channel between Sulu anchorage and Marongas, giving occupation for 60 or 70 boats.

Supplies.—Bullocks may be obtained at about 8 dollars each, fowls are plentiful at about 1½ dollars per dozen, and eggs one dollar per hundred. Sweet potatoes, a variety of other vegetables, and fish may be procured in almost any quantity, and at moderate rates.

At the remarkable tree on point Mubu the large fair or market is held once a week; cattle, poultry, and vegetables are brought in abundance for sale.

Water.—There are several wells within the town of Sulu, but the water is not particularly good, and the best is obtained from a spring on the beach at point Mubu, about three-quarters of a mile to the eastward. Its situation is a curious one, the water bubbling up in a strong stream between high and low water mark into a sort of rocky basin, overhung by the gnarled branches of a large ficus, which must be of great age.*

Coast.—From point Belan the coast trends W.S.W. for 4½ miles to point Pugut, and from there curves towards the south for another 4½ miles as far as Silanga point, the western extremity of Sulu. All this part is safe, a depth of 4½ to 10 fathoms being found at the edge of the narrow reef that borders the shore.

Takut Buansa, a shoal covered by 3¾ to 5 fathoms, lies half a mile W.N.W. of point Mangalis, about 2 miles to the westward of point Belan.

Tulian island, situated 1¼ miles from point Pataluan, is 208 feet high, clean, and cultivated; the channel between the island and the point is clear, and deep near the island; but there are only 4¾ fathoms to a distance of near half a mile from the point. Busson rock, which lies 2½ cables N.W. of Tulian, is covered by 4 feet water with 19 fathoms outside it.

Matos shoal, about one mile north of Silanga point and half a mile from the shore, is covered by 5 fathoms.

ISLANDS NORTH of SULU.—These form a group of six large islands, and several small ones, separated from the N.W. point of Sulu by a safe and direct channel 3 miles wide and 15 to 30 fathoms deep.

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* Cruise of the Marchesa.

Marongas island, 285 feet high, half a mile south-west of Pangasinan, is separated from it by a channel 8 fathoms deep. Anchorage may be had in 7 to 12 fathoms at one cable from the coasts of these islands, but the currents are strong.

Pangasinan is 548 feet high; at three-quarters of a mile to the north-east there is a bank of one mile in extent, with 3¾ fathoms on it; and at half a mile south there is a smaller shoal of 3¾ fathoms.

Hegad island, low and flat, is separated from Pangasinan and Bubuan by safe and deep channels. The little islet Tawi Tawi, one mile to the west of it, has a small reef on the east and west sides, but is steep to on the north and south sides.

Minis island is the north-easternmost of the group, one mile in extent, low, flat and steep-to.

Bubuan is 498 feet high; on the south side are two islets of no importance; the channel that separates it from Kabukan is divided into three by the little islet Lahat-Lahat (not named on the chart) and the bank Concas; these passages are about 2 cables wide, and 5½ fathoms deep.

Kabukan is 4 miles in extent east-north-east and west-south-west, and about 50 feet high, and perfectly flat. On the south side it is clean, but the north and west sides are bordered by a reef which extends half a mile to the westward; the eastern part ends in several islets covered by mangroves.

Aguirre bank (Tong-Tong) with less than 10 fathoms on it extends to 2½ miles from the south-west coast of Kabukan, and is one to two miles wide north and south. The shoalest part, with 4 fathoms on it, lies about 2 miles from the western extreme of Kabukan. A sounding of 3 fathoms is shown at a distance of 6 miles west-south-west of Kabukan, with 5½ and 9 fathoms near it.

Pantokunan, situated 3½ miles north-west of Kabukan, is circular, about one mile in diameter, it is low and flat, clean and steep-to on the south side, but bordered by a coral reef one-third of a mile wide on the north side. This island appears to be on the Pangutarang bank, hereafter described, as in the channel between it and Kabukan there is a depth of more than 110 fathoms.

Sulade island, which lies south-west about 7 miles from point Bunga (Parang) in Sulu island is very flat, and forms a complete lagoon enclosing an archipelago of islets, with an entrance navigable by boats at high water on the south ; on the western extreme are two remarkable trees like fan-palms on its west extreme, which, when approaching the island from north or south, make like the sails of two prahus.

There is anchorage on the west side of Sulade island in from 6 to 10 fathoms, sand, the bottom being even, and the soundings decreasing regularly to the shore.

Strong currents prevail, a rate of 3¼ knots having been experienced at ordinary tides, running principally to the north-east, the weaker W.N.W. 2¼ knots.

SOUTH-WEST COAST of SULU.—Point Bunga, 2 miles south of point Silanga, is surrounded by a reef which extends along the coast from before the town of Bauisa to the northward, as far as the town of Parang to the east. The reef is about half a mile wide, and near its edge the depth is 7 to 14 fathoms.

Parang.—The village, consisting of thirty or forty houses in line, is built on piles in the sea, each house being connected with the shore by a separate bridge of palm-stems. H.M.S. *Mosquito* anchored in 8 fathoms about half a mile from the shore, close to some fishing stakes with mount Temontangis N. 31° E., and Kabukan point S. 64° E. From this anchorage the water shoaled gradually towards the landing place opposite the east village : on each side of the channel there was a reef with fishing stakes on it.

Batulakit bank is a group of six shoals, lying three-quarters of a mile south-east of point Kabalian, and occupying a space of 7 cables extent, covered by one to 3 fathoms with one rock awash at low water—generally marked by a stake—to the westward : the depth between them is 6 to 7 fathoms.

Clearing mark.—Point Parang open of point Tubingatan, the point west of Kabalian, bearing N.W. ¾ W. leads south-west of Batulakit shoal ; and mount Mabintin N.E. by E. leads south-west of the shoal.

MAIMBUN BAY[*] is much frequented during the N.E. monsoon, but is liable to a heavy swell during the S.W. monsoon, which sets in in June. The bay is 8 miles wide between point Kabalian to the west and point Putik to the east, and 2 miles deep to the northward ; at the head are the river and town of Maimbun.

The coasts of the bay are bordered by a narrow coral reef, and a depth of 5 fathoms will generally be found at 2 cables from the shore. The western coast is wooded, with cleared spaces: the towns of Lagassan and Lubang are on this shore. The eastern shore is covered by mangroves;* the town of Punungan lies not far from Putik.

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[*] *See* plan on chart No. 928.

Banks.—Within the bay, and fronting the river, there are two banks, the southernmost of which is always dry, and is named Dry bank; the northernmost dries at half ebb. There are, besides, four shoals: Marban bank, with 1¾ fathoms least water on it, lies S.E. by E. ½ E., 5 cables from the reef of Dry bank; another shoal of 1¾ fathoms lies S.S.E., 5 cables from the same reef; and two patches of 4½ fathoms† lie E. ½ S. and E. ¾ N. of Dry bank. The depth between the banks and shoals and the shore is from 5½ to 14 fathoms.

Directions for Maimbun anchorage.—There are three channels between the shoals into the road. The eastern, between Marban bank and the eastern shore of the bay, seems to be the best; it is about half a mile wide, and, with the exception of the 4½ fathom shoal above mentioned, not less than 7 fathoms deep in the middle Mount Mabintin (the hill 1,614 feet high, to the eastward of Maimbun), kept on a N.E. bearing until the N.E. end of Patian island is just open of point Sirugai,‡ will lead to the entrance of the eastern channel; then steer in for the town with these marks just open, closing them as the town is neared. The next best channel is that between Dry bank and Marban bank. If this passage be taken, Dry bank should not be brought to bear westward of north until the 1¾ patch S.S.E. of it is passed; this bank can generally be distinguished by the fishing stakes on it, and if these should not be in place it can be distinguished even at high-water by the light colour of the water over it. When this patch bears east a course should be steered to pass between Dry bank and Marban. If unable to make out the position of Marban bank, it can be passed to the southward, bearing in mind that it bears W. by N. of the little hill near point Putik. The western passage is not recommended, as it is only 2 cables wide between the northern bank and the bank off the mouth of the river; the conspicuous house on the east side of the river mouth brought on with the shoulder on the north of mount Mabintin leads into the western entrance; and, gradually brought on with the summit, leads to the north-westward of the shoals, to the anchorage of Maimbun.

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* Commander W. McCastle, H.M.S. *Curlew*, 1878, remarks:—"There is a spit extending from the eastern shore about 2 miles inside point Sirugai; it runs out more than half a mile with but 6 feet of water on it at low-water." Point Sirugai, however, is not marked on the English chart, nor on the Spanish chart, nor is it mentioned in the Spanish Derrotero of 1879.

† H.M.S. *Egeria* obtained 4 fathoms on the shoal nearest Marban bank in 1880.

‡ This appears to be the point off Punungan, not named on English chart.

Anchorage.—Vessels can anchor in 5 to 8 fathoms off the mouth of the river, with Teumabal island bearing South, and Patian island S. 40° E. The water runs deep to the bar.

Tides.—In Maimbun bay the tides are irregular; it is high-water, full and change, at 7h. 30m.; springs rise 4 feet.* Inside the banks the stream is insensible, and in the offing it does not reach to a mile an hour. Flood stream sets to the west; ebb to the east.

Maimbun town is the residence of the Sultan of Sulu. The houses are built on piles on the outer edge of the bar, which has only a foot of water on it at low-water. In 1880 trade was carried on between Labuan and the island and rivers of Borneo.

Fresh provisions can be obtained, but are not abundant. Vegetables scarce; fruit plentiful in their seasons.

Teumabal island lies south-west 3½ miles from point Putik. It is small, low, and surrounded by a coral reef which projects to the eastward as much as a mile.

Patian and **Lumbian** islands are clean and steep-to; in the channel that separates them there is anchorage in 12 fathoms. A patch of 3 fathoms lies off the south-west point of Lumbian. Villamil rock, between Patian island and point Putik, is surrounded by more than 14 fathoms. The passage between Patian and Teumabal island is clear and deep.

Tutu bay, east of Maimbun bay, is only separated from the bay on the north side of Sulu island by a low isthmus, 2½ miles wide. A narrow steep reef skirts the western shore of the bay, but from the northern shore, and also from the south-eastern between Tutu point and Karang-dato point, the reef extends to 1½ miles from the coast. Serrantes shoal, covered by 1½ fathoms, lies three-quarters o a mile from the western shore. The towns Pandangpandang, Karong-dato, and Sang, are on the eastern shore.

Anchorage may be had in the bends on the western side of Tutu bay, and in the islets in the reef on the northern and eastern sides. The bay is sheltered from the southerly winds by Pata island.

Pata island is circular, about 4½ miles in diameter, and rises in the centre to a mountain 1,434 feet high. The shores are clean and steep-to, except on the eastern side, from which a reef extends 2 miles to the eastward, having upon it an island almost joined to Pata. The islet Damokan lies 4 cables to the north-west of Pata.

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* Spanish Derrotero; but Remark books of H.M. ships give 6 feet.

Dong Dong island is low, flat, and surrounded by a steep reef; Tambulian, a small round island with a shoal extending to half a mile from its south-east shore, lies three-quarters of a mile north-west of Dong Dong. Anchorage may be had on the shoal in 8 fathoms.

Pitogo bay, between points Karong-dato and Tandikan, is surrounded by a shoal which extends one mile from it to the south and east, and fills up the bay to the northward.

The edge of the bank on which the archipelago is situated is close to the shoal to the southward of Tandikan point, and is at the distance of a mile from it, north-east of the point; it is also a mile from point Tandu, the eastern point of Sulu.

The towns Higan and Ganon are in the bay between points Tandikan and Tandu.

TAPUL GROUP.—This group is situated between the Sulu and Tawi Tawi groups.

Tapul and **Bulipongpong** (Lugus).—These two fertile and well-cultivated islands lie about 8 miles south of point Kabalian in Sulu; both have conical peaks, the former is 1657 and the latter 984 feet high. They are apparently clear except to the eastward of Bulipongpong, from which a reef projects about two miles; the narrow channel between them is only fit for boats. At one mile from the south coast of Bulipongpong, the depth is 9 and 10 fathoms, and anchorage may be had in the bight on that side of the island, east of the little islet Gondra, in 8 fathoms.

Kabingaan and **Taluk islands** are two low flat islands on the same reef, with a lagoon inside between them. Pakia island, close to the west side of Kabingaan is also low, and has a narrow reef projecting to 1¾ miles to the south-east, with 1½ fathoms on the end of the reef, and 11 fathoms off it. There are two villages on the islands.

Soundings.—Between the islands Tapul, Kabingaan, and Sulu the depth varies in general from 20 to 40 fathoms, with patches of 10 fathoms.

SIASSI, the peak of which is in lat. 5° 32′ N., and long 120° 52′ E., and 1,714 feet above the sea, is about 6½ miles north and south, and 5¾ in an east and west direction; it is the highest island between Sulu and Tawi Tawi, and may be easily distinguished by the dark patch of trees on its summit, from which it slopes down gradually to the sea, the land being cleared and apparently well cultivated.

There are several large villages built on the reefs that fringe the south-west and east coasts, the inhabitants of which carry on the pearl fishery; the pearl oyster being found in great abundance in the vicinity.

An extensive reef runs off 5 miles to the eastward of Siassi, on the eastern and southern shores of which are numerous low, thickly wooded, and uninhabited islands; Sibihing, the largest, is very low, the sea in some places washing through it at high water.

Off point Bas-Bas, the south point of Siassi, the reef only extends to a quarter of a mile, and at the distance of half a mile there is no bottom at 66 fathoms.

South-west of Siassi the reef runs out for about 3 miles, and is separated from the reef running south of Lapak by a narrow channel, which varies in width from half to one cable, and is only fit for small craft.

Tara island lies on the reef to the north of Siassi, and is about 1¾ miles long in an east and west direction; it is very low on the west side, but about 110 feet high on the east: north of this is a solitary rock, 8 feet above high-water mark, which in the distance resembles a canoe under sail; this rock is near the edge of the reef, and lies about N.E. by E., 1½ miles from the north end of Siassi.

The channel between Tara and Siassi is 12 fathoms deep, and 2½ cables wide; but there are shoals at both ends of it.

Shoals.—Northward of Siassi island, in the fairway of the channel between that island and Bulipongpong (Lugus) island, three shoals have been found, viz.:—

Takut Sungú, discovered by H.M.S. *Swinger*, has been found to extend one mile, east and west, and one third of a mile from north to south, with a least depth of 2¾ fathoms sand and coral, and from 16 to 20 fathoms northward of it. From its centre, the small islet north of Tara island bears E. ¾ S., and north point of Siassi S.E. ¾ E., distant about 1½ miles.

Takut Langon.—About three-quarters of a mile westward of Takut Sungú is the eastern extremity of Takut Langon, with a depth of 6 fathoms; thence the shoal takes a W.N.W. direction for 1¼ miles with a breadth of half a mile, having depths of from 5½ to 7½ fathoms.

From the shoalest part, $4\frac{3}{4}$ fathoms, near its western extremity, the north-east point of Lapak island is in line with a remarkable tree in the town of Siassi; and Selun island bears S.W. by W. $\frac{1}{3}$ W. distant nearly 4 miles.

Between Takut Sungu and Langon there is a depth of from 22 to 24 fathoms.

Bank.—At $1\frac{1}{2}$ miles W.S.W. of Takut Langon, and 2 miles N.E. $\frac{3}{4}$ E. of Selun island, there is a bank of 6 fathoms, about half a mile in extent.

Takut Kadiafan.—Also, eastward of Siassi island, and of the reef which trends S.S.E. from Tara island, a shoal with two heads of $2\frac{1}{4}$ fathoms, has been found on the bank which extends about $1\frac{1}{2}$ miles from the reef.

Between this shoal and the reef northward of Lamenusa island, is a channel half a mile broad with a depth of from 6 to 11 fathoms.

During the N.E. monsoon heavy tide rips are seen near this bank.

Between Takut Kadiafan and Siassi island are several small shoals, and a reef named Bambagan, which partly dries, is situated half a mile from the shore.

Between Takut Kadiafan and Bambagan is the northern channel to Lamenusa anchorage, with a depth of 11 fathoms, sand.

Inshore of Bambagan reef there is a good anchorage in from $3\frac{3}{4}$ to $5\frac{1}{2}$ fathoms.

Lamenusa island,[*] which lies three-quarters of a mile to the eastward of the east point of Siassi, is low, and covered with mangroves; on the north-western part there is a village and coco-nut plantation. To the eastward of the island a reef dries out to a quarter of a mile, and from there the water deepens gradually to the eastward for $1\frac{8}{10}$ miles to the edge of the bank which has 10 fathoms on it: at 2 miles there is no bottom with 55 fathoms.

The channel which separates Lamenusa from Siassi island is divided into two passages by a bank of sand and coral, named Gusun, which dries at low water, and can at all times be seen distinctly. The passage between the bank and Lamenusa is clear, but narrow; and winds more than that to the westward which is navigable by vessels of all sizes.

Lamenusa anchorage, between Lamenusa and the reefs adjacent to the east point of Siassi, is of good width, well sheltered, with good holding ground; the reef uncovers in parts at low-water; it is steep-to, but cannot be easily distinguished, and must be approached with caution.

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[*] *See* plan on chart No. 928, Lamenusa anchorage.

Tides.—The tide stream is very strong at springs; the flood stream sets from east to west and then north through the channel—the ebb from north to south and then east; springs rise 6 feet.

Directions for entering Lamenusa anchorage.—Tara island should be passed half a mile to the eastward in order to avoid the reef off Siassi; then a course S. 29° E. will lead in 6 to 11 fathoms until west of the head of the reef north of Lamenusa; a course should then be steered for Punuan island in line with the eastern point of Siassi, which will clear the reefs off Lamenusa. Punuan island can easily be recognised, being a truncated cone 289 feet high.

The channel between Lamenusa and the Siassi reef should only be used in fair weather, and with a favourable light for seeing the edges of the reefs; it is not recommended for large vessels.

To enter the inlet leading towards Punuan it would be well first to mark the channel, and to keep on the Siassi side as the reefs on that side show large lumps of coral, and have more water near the edge.

Port Siassi.[*]—On the west coast of Siassi, in the northern part of the channel that separates that island from Lapak, there is a Spanish military station, and a sheltered port of 3 cables extent and moderate depth. The settlement contains the residence of the Govenor, fort, a hospital, and about 20 houses.

Entrance, Eastern side.—Point Tolen, on the north-west coast of Siassi island, and 2 miles to the northward of the Settlement, is low and wooded; from it and point Bus Bus, further to the south, a coral reef extends out to the westward for a quarter of a mile, and uncovers at low water; to the northward and westward of this reef, at two cables from it, are two detached coral patches covered by 13 feet of water, and beyond them a bank of 4¾ fathoms extends to half a mile west of the point; an isolated bank of 2 cables' extent covered by 4¼ fathoms of water, lies 6 cables to the north-west of point Tolen. Within the channel two banks of 4¾ fathoms lie off the mouth of the river Bus-Bus, midway between point Tolen and the settlement of Siassi. The northernmost bank extends half-way across the channel; and a small patch of 4¾ fathoms lies 3½ cables north of the fort, and 2 cables from the shore.

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[*] *See* plan of Port Siassi on Admiralty chart, Sulu Archipelago, No. 2576.

Western side.—Point Luangat, the northernmost point of Lapuk island, is of rock and clean, and may easily be recognised by a small hill inland close to it. Point Busluk, half a mile west by south of point Luangat, is easily distinguished from it by being formed of huge rocks, and also by its being quite separated from the mountain.

Point Alikan lies E.S.E. one mile from point Luangat; a shoal of $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms water extends 3 cables N. by W. of this point; and another of $3\frac{3}{4}$ fathoms 2 cables to the eastward. South of point Alikan the Lapak shore is clean as far as a conspicuous beach opposite the settlement of Siassi.

Anchorage.—The reefs in the anchorage between Siassi and Lapak islands are marked by small buoys. The best berth is opposite the settlement, where there is a landing jetty; if intending to remain, vessels should moor.

Supplies.—Fowls, fruit, and fish can be procured in small quantities; water can be obtained from wells at a short distance from the jetty.

Tides.—At Siassi it is high water, full and change, at 5h. 54m.; springs rise $8\frac{1}{2}$ feet. During the south-west monsoon the highest flood-tide is the morning tide; during the north-east monsoon it is the evening tide. In August 1882, three days after the full moon, the *Fly* found the flood stream within the channel setting to the north, with velocity of 2 knots; on getting outside, it was running to the westward.

Directions for Port Siassi.—Coming from the northward, when at the distance of one mile from the entrance of the channel, the *gorro* should be brought to bear S.E., and steered for on that course until points Busluk and Luangat are in line: the extremity of the reef of point Tolen is on a continuation of this line, and must be passed with caution; a course S.S.E. will then lead between the shoals that extend from Siassi island, and the $3\frac{1}{4}$-fathom bank off the coast of Lapak; this bank can also be cleared by keeping the end of the mole off Siassi open of the beach on the north-east point of Lapak, When the flagstaff on the fort of Siassi bears S. $\frac{1}{2}$ E., which will be when the islet Selun becomes shut in by Lapak, a mid-channel course should be taken; and when abreast of the most salient point of sand on Lapak, that coast, which is the safest, should be approached, until off the settlement. Sailing vessels should await a fair wind for entering.

The southern entrance is only half a cable wide, and only fit for vessels of light draught ; the bottom is foul with large rocks, very liable to catch the anchors ; and the force of the tide-stream, which reaches 4 to 6 knots, would probably part any cable. For entering, a vessel in the offing should be placed fairly in the direction of the channel between the reefs, and then steered for the most conspicuous house in the village of Manubal, on a N.N.W. ½ W. course. At low water, and in clear weather, the eye can trace the direction of the channel ; but at high water, and in dull weather, the passage should not be attempted without a pilot, and only in case of necessity. In the northern part, where the channel divides into two passages, the westernmost, which is the deepest and widest, should be taken ; then, passing near the islet Taktagan, the channel between Siassi and Lapak will be entered.

Lapak is three-quarters of a mile to the westward of Siassi, and is about 5 miles in a N.E. by N. and S.W. by S. direction, and 3 miles wide ; unlike Siassi, it has two conspicuous peaks with a great dip between them, so that in the distance on a south-east bearing it looks like two islands. A reef runs 3¼ miles to the southward and eastward of this island, and nearly joins the reef running to the southward and westward of Siassi. One-third of a mile from the south-west point of this island is a dangerous patch of rock with 8 fathoms between it and the shore.

Manubal.—The island of Manubal on the south part of the Lapak reef has a large fishing village on the north-eastern side.

Anchorage.—There is good anchorage in from 7 to 12 fathoms, sand and coral, to the southward and westward of the small island, Pandami, west of Lapak, and immediately off the village.

Supplies may be obtained at Lapak, such as bullocks, goats, and fowls, at a moderate rate, but vegetables are scarce. About 50 yards from the beach there is a well, but water could only be obtained from it in very small quantities.

Selun is a small island 2⅔ miles north-west of Lapak ; it is about a quarter of a mile long, 153 feet high, covered with trees, and steep-to, with a clear channel between it and Lapak.

Tapaam, a low island south-west of Lapak, is of semi-circular form, with the concave side to the westward, and very narrow in the middle, being in some places only half a cable across ; it stands on a coral reef that is dry at low water, with a small sand cay on the north and an extensive one on the south side, curved towards the coast of Lapak.

The channel between Tapaam and Lapak islands is about 1½ miles wide, and entering from the south, Selun just open of Lapak, clears the reef off the south-east point of Tapaam; steering to the northward with this mark on until the south point of Lapak bears E.N.E., a course of N.W. by W. leads through the channel to the northward of Tapaam.

Tapaam passage, which is formed by Tapaam and Lapak to the eastward, and Bubuan and Maniakolat to the westward, is about $6\frac{1}{2}$ miles wide at its narrowest part, viz., between Maglumba, a small island, 123 feet high, off Maniakolat, and the north-west side of Tapaam. This passage is clear for a steamer, and would be convenient for a sailing ship, as the tides make fairly through it, and in calms or light winds a vessel could always anchor to await the change of tide.

Crest of Wave shoal is in the fairway of the Tapaam passage, and the shoalest part of $4\frac{1}{2}$ fathoms lies about N.E. $\frac{1}{2}$ E. $4\frac{3}{4}$ miles from the little conical island of Parangaan, on the south-west side of the passage.

It is composed of coral and sand, and the bottom is rather uneven, the 10-fathom limit extending $1\frac{3}{4}$ miles in a north and south, and $1\frac{1}{6}$ miles in an east and west direction. As a rule it is easily discerned by the tide ripplings round the edge of the shallow water; the discoloration of the sea also is very marked.

Tapaam shoal is a small patch of coral and sand nearly midway between Tapaam and Bubuan; it is about $1\frac{1}{6}$ miles in extent north and south, and four-fifths of a mile wide to the northward, terminating in a norrow point to the southward. The least water found on this was $4\frac{3}{4}$ fathoms.

TAWI TAWI GROUP.—Parangaan is a conical islet, 90 feet high, clothed with light grass; about $3\frac{1}{2}$ cables westward of the island is a small flat-topped islet, 14 feet high; there is a narrow 7-fathom channel between the dry reef running to the eastward of it and Parangaan.

A dangerous rock awash at spring tides, and in smooth water scarcely discernible until close to, lies S.W. by W. about $2\frac{1}{2}$ miles from Parangaan. A bank, with from $1\frac{3}{4}$ to 5 fathoms on it, runs S.S.E. $2\frac{1}{3}$ miles from the rock.

Maniakolat and Parangaan are connected by a bank of soundings with from 7 to 10 fathoms; Maniakolat is thickly wooded, $1\frac{1}{2}$ miles long north and south, and three-quarters of a mile east and west. The peak, 773 feet high, shows from nearly every direction as a perfect cone. An islet 60 feet high, and wooded, lies nearly 4 cables west of the south-west extreme of Maniakolat, with a channel between.

About a mile E. by N. from the north point of Maniakolat is an islet, about 1½ cables long and 123 feet high ; there is a deep channel to the westward of this islet.

Bubuan island is about 2½ miles long north-west and south-east, and 2 miles wide, with a shallow channel, half a mile wide, between it and Maniakolat. Bubuan is covered with trees, and from the highest peak (457 feet) a chain of hills extends to the eastward, terminating at the north point.

On the west side of Bubuan is a shallow lagoon, with a bar nearly dry at low water ; in this lagoon numerous fishing prahus seek protection from stress of weather, and into which they crowd on the approach of a steam-vessel ; from H.M.S. *Nassau* fully 200 of these boats were observed dredging for pearl oysters, south and east of this island.

Mid-channel bank.—The chart shows a bank N.W. of Maniakolat, extending 7 miles N. by W. ½ W. and S. by E. ½ E., covered by 4 to 9 fathoms, with rocks awash about the middle ; and two patches of 1¾ fathoms on the English chart, but marked as banks that dry on the Spanish charts.

Kakataan island, though low and flat, is covered with trees, the tops of which are 105 feet above the sea ; it is about a mile long in a north-west and south-east direction, with a reef that dries 3 cables from its north-west extreme.

Sigboyé, one of the highest islands of this group, and thickly wooded to the summit, lies about S.W. by S. 5¾ miles from Kakataan. It is steep-to on the north side, but a rock with 2½ fathoms lies 3¼ cables to the southward of the island.

Tambagaan island, the north-east point of which is W.S.W. 1¾ miles from the west point of Sigboyé, is about 3 miles long and 1½ miles broad, with a conical green peak over its east extreme. There is a deep channel with strong overfalls between Sigboyé and Tambagaan.

Off the south point of this island there are two rocks or islets, and some patches covered by 3¼ and 4¼ fathoms of water ; the rock nearest the island, 25 feet high, is surrounded by reefs ; from the other rock, 8 feet high, south-west of the island, the western side of Tambagaan bears N. 34° W., and the larger islet N. 60° E.

Simaluk and Kuad Basang.—The east point of Simaluk which is the larger of these two islands, lies 4 miles to the north-west of Tambagaan island : these islands are similar in shape, being like horse-shoes, with the concave sides to the eastward; the indentation in Simaluk is nearly filled up with numerous small islets.

Both are surrounded by a fringe reef, and between the two is a shallow coral patch three-quarters of a mile long north and south, on which the sea breaks heavily during the north-east monsoon. There is anchorage both east and west of this patch, but it is not recommended, as the anchorage south of Tambagaan, only 6 miles distant, is preferred.

There are no houses on either island, but the natives visit them in great numbers, the fishing ground inside the reefs being so good: at the approach of a boat or steamer the natives take to the woods, and it is difficult to hold communication or obtain information from them.

Magpeos island, to the southward of Bubuan, is an almost perfect cone, 418 feet high, having a reef, with a rock awash at the end of it running out from the island a little over 3 cables in an E.N.E. direction.

Tagao island, lying S. by W. 1⅓ miles from Magpeos island, has four small peaks, the highest of which, on the north-west extreme of the island, is 270 feet above the sea. It is hilly on the west, but flat on the east side, the whole covered with trees. There is a deep channel between this island and Magpeos.

A rock has been found, with 1¾ fathoms on it, one-third of a mile south-east of Tagao island, and this island should be given a berth of a mile when passing it to the eastward.

Pandanan and Tankolaluan are two small coral islands lying to the westward of Tagao, they are covered with trees; the former is 90, but the latter 107 feet above the sea.

Two cables west of Tankolaluan is a small rock that seldom covers, and on which the sea breaks heavily with strong north-easterly winds.

KINAPUSAN GROUP, lying nearly 10 miles to the southward of Babuan island, consists of the three low, densely wooded, coral islands of Tabawan, Bintoulan, and Kinapusan. Tabawan has several small islands and islets on the reef south of it, and is separated from Bintoulan and Kinapusan, which latter islands lie on the same reef, by a 5-fathom channel. There is also a clear channel between Tabawan and Loran which lies to the westward of it.

The reef off Kinapusan extends 1⅓ miles in a E. by S. direction from that island, and near the outer edge there is a sand cay that dries 3 feet at low water.

As the reefs to the southward of these islands are steep-to, and the lead consequently gives no warning, care should be taken when navigating in this vicinity. The tides here are also strong. Two miles south of the western islet of Tabawan, in the corner of the reef, is a patch of rock that seldom covers except at very high tides.

Anchorage.—The best anchorage is with the west extreme of the village of Tahing Tahing on the north side of Tabawan about S.S.E., three-quarters of a mile off shore.

The tides are regular here, and not very strong.

Supplies.—The island of Tabawan is thickly populated, but Bintulan and Kinapusan are only resorted to for fishing, this being the chief occupation of the natives, and upon which they depend principally for the means of subsistence.

Numerous boats also leave Tabawan in the season for the pearl oyster banks. No provisions are to be obtained here except fish and coco-nuts, in small quantities.

As a rule the natives take to the jungle on a steamer appearing, the Spanish squadron having burnt their town down for acts of piracy; but during the *Nassau's* intercourse with them they appeared harmless and inoffensive.

Loran island.—The north-west point of this island is S.W. by S. 6½ miles from the south point of Tagao; it is 1⅓ miles long north-west and south-east, about 3 cables wide, and elevated on the north-west side 158 feet above the sea. It is connected by a coral reef with the little island of Manote to the southward.

The northern point of Loran island is steep-to, a fringe of coral surrounds the remaining shores at a distance of from one cable on the north-east to 6 on the south-west side; on this reef, to the southward, are several small islets.

This island is inhabited, and partially cleared and cultivated, as also is Ubian to the southward.

South Ubian island, about three-quarters of a mile to the south-west of Loran island, is triangular in shape, with the apex to the north-west, the principal houses being built on the north-east and south-west sides; it is the best cultivated and most thickly populated of this group.

The island is surrounded by a coral reef extending from it to a distance of three-quarters of a mile on the east side, having several little islets upon it, the highest of which dries 8 feet at low water.

The town on the north-east side was destroyed by H.M. gun-vessel *Dwarf*, in 1869, for piracy committed on an English schooner.

It is reported that these natives are still pirates; they all fled from their houses on the approach of H.M.S. *Nassau*, and notwithstanding a pilot and a messenger from the Sultan of Sulu was on board, they could not be induced to return.

There is no passage, except for boats or small vessels, between Loran and Ubian.

THE TABUAN GROUP, about 2 miles to the southward and westward of Ubian, consists of a number of rocks and islets, the largest of which, Tabuan, is inhabited.

The group lies on the eastern edge of a large coral reef which stretches away to the north-west for 5 miles from Tabuan island with the rocks Lijat-Lijat on the north-west extreme, and to one mile to the southward with numerous sand cays on it. On the Spanish chart the reef is named Bukutkut.

Pasegan Samal is a low coral island 5 miles W.N.W. of Ubian, covered with trees, the highest of which is 90 feet above the sea. It is fringed with a reef to the northward and eastward to the distance of 4 cables from the shore, with soundings of 2¾ to 6½ fathoms at the edge. At 6 cables N.W. of the island is a narrow bank nearly a mile in length covered by 2½ to 5 fathoms, with 5½ and 8 fathoms at the edge.

Pasegan Guimba,* situated 1½ miles to the west of Pasegan Samal, is very similar to it. To the N.W. and S.E. of this island are several banks separated by narrow channels; those to the S.E. join the rocks Lijat-Lijat, on the N.W. the Tabuan bank. The channel that separates the Pasegan islands is safe and deep between the edges of the reefs.

Anchorages.—There is fair anchorage off the north end of Ubian island in from 7 to 12 fathoms, sand, and on the bank east of Pandanan island in from 8 to 10 fathoms, sand. H.M.S. *Nassau* also anchored east of Kakataan in 10 fathoms, sand, and on the mid-channel bank between Kakataan and Bubuan islands, both to the south-west and north of the rocks awash; at the former anchorage in 7 and the latter in 8 fathoms, sand and shells.

Tides.—Between Sulade and Kakataan islands the flood tide runs to the north-west and the ebb to the north-east, not with much force in the open channel, but very strong round the islands, so that when steaming from Kakataan across the channel between Sulade and Sulu, against the tide, H.M.S. *Nassau* had to steer N.W. to make a N. by E. ½ E. course.

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* Not named on chart.

In the channels on either side of the mid-channel bank, the flood tide runs nearly north and the ebb about south, with a velocity of from one to 3 knots.

Off Pandanan the tides runs about N.N.W. and S.S.E., and at the anchorage north of Ubian the flood tide runs north-west and the ebb south-east, with a velocity of from one to 3 knots.

It is high water, full and change, at Ubian island at 6h. 15m., and springs rise 5 feet.

South of Ubian, and between that island and the Tabuan group, the tide runs fully 4 knots at springs round the edges of the reefs, where its greatest strength is felt.

Supplies.—At present there are no supplies to be obtained from the islands of the Tawi Tawi group. Wood may be cut on any of them for steaming purposes.

Vessels navigating these waters must be very cautious, as the natives are treacherous and not to be depended on.

Tawi Tawi island, the principal of the group, is 29 miles long and about 14 miles wide. A range of mountains traverses its entire length; to the north-east mount Bujimba rises to a height of 897 feet; mount Batua, overlooking port Dos Amigos, is 1,283 feet; and in the centre is mount Dromedario, which culminates in four peaks, the highest of them being 1,864 feet high.

The appearance of the island is very varied and presents a number of small woods separated by spaces of smooth green.

The little isles that surround Tawi Tawi are sparingly inhabited, and were generally regarded as refuges for pirates.

The north coast of the island is safe, and affords several sheltered anchorages with good depths of water. The north-east coast is bordered by a chain of islands of moderate height which present anchorages for all classes of vessels passing between them to the north or south coast of Tawi Tawi. The south coast is also bordered by islands and reefs which extend 10 and 15 miles to the south and south-west, leaving deep passages between them to the bays on the coast. The south-west coast, or south coast of Sanga Sanga islands, is very clean and steep-to.

ISLANDS OFF the EAST COAST of TAWI TAWI.—Bas Bas island is low and covered with mangroves, with a hill about the middle of the western side 256 feet high. The island is steep-to and clean, except to the north-east, where there are three rocks at 4 cables from the shore; while off the south point two rocks extend to more than a mile to the S.E. with several heads above water.

Pajumajan island lies one mile to the east of Bas Bas, and has on its north-west extremity a hill 112 feet high ; it is surrounded by a narrow bank of sand, with a rock on a small shoal, and two great rocks (named Pamakalan and Pamagbaran) situated respectively 2 and 4 cables from the south coast. There are several rocks in the middle of the channel between Pajumajan and Bas Bas.

Bas Bas channel, between Bas Bas island to the eastward, and the north-west extremity of Tawi Tawi and Tabulunga island to the westward, is 2½ miles long and 4 cables wide. The northern part is direct and safe, with 11 to 4¾ fathoms depth, but the southern part is narrowed by shoals, and the depth is diminished in many places to 2¾ fathoms, so that a vessel drawing over 16 feet should not attempt this channel. In the northern part of the channel there is sheltered anchorage with good holding ground for vessels of all sizes; there is no danger in it, and the sides are steep, but the entrance points are surrounded by sand shoals, which extend 1½ cables out.

Tabulunga is separated from Tawi Tawi by a narrow and supposed to be impracticable channel (Maiput channel); its shores are covered with mangroves, with 2 to 3 fathoms of water alongside the east coast. This coast, and the banks which extend S.E. from Bas Bas island towards Dalumon island, form the continuation of the Bas Bas channel, which is narrowed here by an islet, and a steep bank covered by half a fathom of water, with a rock on its northern end.

Dalumon island, lying 1½ miles S.E. of Bas Bas, is clean, with only a small shoal on its north-west side ; the channel that separates it from the banks of Bas Bas is 3 cables wide, and 5 fathoms deep.

Tankan islet, 3 cables S.E. of Dalumon, is round, of 3 cables diameter, and surrounded by depths of 5 to 7 fathoms. In the middle of the channel that separates it from Dalumon there are 2½ fathoms ; and near Tankan, 6 fathoms.

Baturrapa island is clean and steep-to ; there are 6½ fathoms in the channel between it and Tankan.

Dangers.—At 7 cables S. ¾ W. of the eastern extremity of Baturrapa there is a rock that uncovers, surrounded by 5½ fathoms, and at 9 cables S.S.E. there is another rock covered by 1½ fathoms. A patch of one fathom lies 2 cables N.E. of the east point of Baturrapa, and another of half a fathom lies 1½ miles east of the same point.

Tonkian islets* are two little islets clean and steep-to, lying three-quarters of a mile south of Dalumon; in the middle of the channel between them and Dalumon there are 8 fathoms.

Tubulutubu island,* W.S.W. of Tonkian islets, is separated from them by a passage 2 cables wide, and 2 to 5 fathoms deep. A small shoal, and a patch of 2 fathoms lie near it, to the northward.

The coast of Tawi Tawi at this part is low, submerged and covered with mangroves, and bordered by shoals.

Tandubatu island, separated from Tawi Tawi by an impracticable channel named Gallo Mallo, is nearly round, and about 5 miles in diameter. The peak of Tandubatu rises to a height of 635 feet from among a chain of hills on the northern coast. The shores of the island are skirted by a labyrinth of reefs and islets. Taruk is a low island about 1½ miles in extent, almost joined to Tandubatu; it is surrounded by shoals and islets; those to the southward form the western side of the channel Nochebuena. One of the islets on the north-east side, Nahaun, 282 feet high, is a mark for the Nochebuena channel. A shoal in the form of the letter **S** extends to the north-east of it, parallel to the coast of Kalupag.

Great Kalupag forms the eastern side of Nochebuena, and the western side of Kalaitan channels. It is divided into two by the narrow channel Kalanhalangan, and shows several hills, the highest of which is 590 feet above the sea. To the northward the island is clean, with deep water near it, but the southern part is surrounded by reefs and islets near which the general depth is 2½ to 5½ fathoms.

The Kalaitano islets lie on an extensive reef between the south-east coast of Great Kalupag and the Tabuan reef.

Little Kalupag, lying 2 miles north-west of Pasegan Samal, has on its north-west and south-east extremities two conical peaks, 370 and 354 feet high, which, when seen from Pasegan and Ubian appear united to Tawi Tawi. The island is clean and its sides steep. The islet Bakiki lies 2 cables from the north-west side of little Kalupag, and at 7 cables north-east of the north-east point there is a patch covered by 2¾ fathoms. The channel that separates little Kalupag from the north point of great Kalupag is 5 cables wide, and is divided into two narrow deep passages by the little clean island Charuk.†

CHANNELS to the EAST of TAWI TAWI.—There are four channels between the islands and reefs that lie east of Tawi

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* These, and several other small islets near the coast, are not named on the chart.

† The islets Bakiki and Charuk are not named on the chart. In the *Nassau's* survey Channel rock, (not examined) is said to lie N.W. ½ W. 8½ cables from the north point of Little Kalupag.

Tawi and west of the Great Tabuan or Bukutkut reef; of the four, two only are navigable by vessels of any draught, these two being Kamba or Lijat, and Nochebuena or Tambiluanga; the other two are foul and of little depth.

Kamba Kamba channel, between the reefs of Tabuan (Bukutkut) to the east, and those of Kalaitan to the west, is 2 miles long in a north and south direction, and a third of a mile wide in the narrowest part, with a depth of 9 fathoms. To enter it from the northward, a vessel should pass between Kalupag and Pasegan Guimba, or between the two Pasegans. This channel is considered preferable to that of Ubian for vessels of good draught of water, but should not be attempted at night; the currents in it are very strong.

Kalaitan channel, between the edge of the Kalaitano islands bank and the south coast of Great Kalupag, is only practicable for handy vessels of less than 6 feet draught. The north entrance is divided into two arms by a shoal; the southern end joins the Kamba Kamba channel by the Sipungut channel, which runs east and west, and is practicable for small craft. The little channel north of Tandubas is impracticable.

Nochebuena channel, between Kalupag and Tandubato islands, allows a passage to the south of Tawi Tawi without leaving the archipelago, and without exposure to the sea of the open waters, which is some times very heavy during the S.W. monsoon; it is practicable for vessels of 19 feet draught, and there is anchorage everywhere in it. It is 6 miles long, and 4 cables wide in the narrowest part.

Directions for Nochebuena channel.—Coming from the north: when to the westward of and near to Little Kalupag a vessel should steer S.W. for a hill 282 feet high on the S.E. part of the islet Nahuan, and continue that course until a hill 590 feet high on the north-west part of great Kalupag bears S. 40° E. in line with a smaller one 476 feet high near the beach; she should then steer S.S.W. and pass in mid-channel between a narrow bank covered by 13 feet on the northern end, and 3 feet on the southern, and a rocky shoal covered by 10 feet, until abreast of the little verdure-clad islands Tampa Tampa and Gondol, which must be passed close to; she should then steer S.W. for the hill 633 feet high on the south-east coast of Tandubato island, and continue this course in mid-channel between the islet Singabuan to starboard and the islet Sibulak to port, and then turn to the south, passing at one cable to the east of a remarkable and clean rock N.E. of the island Tambiluanga and close to it.

From this rock the course is S. 7° E. to pass midway between the shoals Ambilon and Kasapaam, in depths of 5½ to 6½ fathoms, with some patches of 4½ fathoms which can be avoided by borrowing somewhat to the eastward, where the depth is greater; then the passage is to the west between the islands Plus and Ultra into the great bay south of Tawi Tawi.

Caution.—It is not prudent to pass between the islands Plus and Ultra with the sun in the face, and low; at other times the banks can be distinctly seen and no mistake can be made with the chart under the eyes. The channel between the islands is narrow, and the least depth is 4 fathoms. The natives of Ultra often open fire on vessels passing through the channel. Another passage practicable for small vessels is north of Ultra and of Pintada island, which is on the same bank.

Water.—On the south-east part of Tabiluanga there are three wells of good water, but the supply is not great.

Gallo Mallo channel, between Tandubato and the east coast of Tawi Tawi, can be penetrated by gun-boats to a distance of 2 miles from the northern end. The sides of the channel are high and covered with lofty trees. Many creeks open into it, and it is supposed that there is in the locality an important town named Mapait by the natives.

ISLANDS SOUTH OF TAWI TAWI. — The islands Tandubas, Sekubun and Lataan are low; they are inhabited and cultivated in the interior, with wooded coasts. They lie so close together they generally appear as one island. The outer edge of the reef on which these islands are situated, is very distinct, and very steep, there being no bottom with 114 fathoms at a cable's length from it.

The passage between Tandubas and Sekubun is only fit for light native craft; the channel between Sekubun and Lataan, called Paragua channel, can be used by vessels of any size; the edges of the reef can always be seen from aloft.

Mantabuan and Banaran are two flat islands united by a reef on which is an islet, Sasa. Mantabuan is inhabited, but Banaran is not. The channel between Mantabuan and Lataan is 6½ fathoms deep; the edge of the Mantabuan reef can be clearly seen, and is very steep, but the western end of the Lataan reef runs out more, and is not so clear. In order to enter this channel a vessel should be placed with the north point of Mantabuan bearing N. 73° W., and the south point S. 60° W.; from this position a course should be steered N. 53° W., on which bearing a small sand bank named Circe bank* that generally uncovers, may be seen.

The channel west of Banaran is wide and has 6½ fathoms water in the middle; it can be navigated by keeping in the middle between the edges of the reefs.

Basibuli reef, with the islet Basibuli on the centre, some smaller islets to the south-west, and the islet Pananpangari on the north-east end, partly uncovers at low water; the reef is of sand and coral, steep to, and may be ranged close to. The channel to the westward of the reef is deep.

Bilatan island and Bilok Bilok reef.†—Bilatan is an island about 3½ miles long on the eastern side of the great Bilok Bilok reef, that runs south from Tawi Tawi island. There appear to be some large villages in the interior of this island, and judging by the number of boats passing between it and Tawi Tawi and the islands to the south-west, there is great traffic carried on between them.

From the south-west end of Bilatan the coral reef with sand cays extends for 9 miles to the south-west; it is from 2½ to 3 miles in breadth, and upon the reef is a chain of small islets, also running to the south-west, one of the largest, Tumbukan, having a huge tree in the centre of it.

Tiji Tiji bank, which forms the south-west extreme of the reef, is separated from it by a channel 5 fathoms deep, called Balseiro channel.

Balambing channel separates the Bilok-Bilok reef from the coast of Tawi-Tawi; the north-west extreme of the reef is not easily distinguished; vessels using the channel should therefore keep on the coast side.‡ On the north-west part of the reef, about one mile south of Balambing, are two small flat-topped rocks named Dulang-Dulang, from which the reef dries as far away to the eastward as can be seen, dotted here and there with little black boulders. From the Dulang-Dulang rocks the reef runs to the southward for about 5 miles, then trends away to the south-west towards Simonor island.

Laa island, of coral formation, and covered with trees, the highest being 116 feet above the sea, lies about 1½ miles from the north-west edge of Tiji Tiji bank.

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* Not named on the Spanish chart.

† *See* Admiralty chart:—Bongao anchorage, No. 1,243; scale, $m = 1$ inch.

‡ Lieut. Moody, H.M.S. *Egeria* 1880, remarks: "The channel off Balambing point only carries 2 fathoms."

Sanguisiapo is a low coral islet, with a few straggling bushes on it, standing on a coral reef that runs in a W.N.W. and E.S.E direction, about 1¾ miles long ; this reef is steep to the E.S.E., but from its W.N.W. extreme a shallow bank of sand and coral runs out, the 5-fathom limit of which is 1½ miles W.N.W. of the western end. There is also a patch of rocks and a rock awash about N.W. by N. one mile from the highest bush on the island.

Danger.—Between Laa island and Sanguisiapo is a dangerous coral reef about a quarter of a mile in extent, and to the westward of this again in the same direction is a three-fathom bank.

Simonor and **Manuk Manka** are the two largest off-lying islands to the southward of Tawi Tawi. Simonor has a fringe reef of coral round it, which is steep-to, and there is no anchorage round its coast ; there is also a shallow lagoon in the middle of this island, in which the native prahus take refuge on the approach of danger.

Manuk Manka has a fringe reef nearly all around it, and is also steep-to ; there is a deep channel between these islands, as well as between Simonor and the islets and reefs north and east of it. There are several large towns on Simonor, and both it and Manuk Manka are thickly inhabited.

If bound to Balambing or Bongao from the southward and eastward, the north sandy point of Manuk Manka should be steered for until the west end of Laa island comes in line with a remarkable cliffy hill on Tawi Tawi island called the Thumb, bearing N. ⅓ W., which leads nearly mid-channel between Simonor and the Tiji Tiji bank ; when near Laa island haul to the north-east, passing it within a couple of cables.

Bongao island.—This island, the most western of the Tawi Tawi group, is about 2¾ miles long by 1⅓ broad, and the highest peak is 1,151 feet above the sea, but other peaks attain nearly the same altitude. All these peaks are cliffy to the northward, and present a curious appearance on some views from that direction, the summit of the island having apparently been broken up by volcanic agency. With the exception of the cliffs before mentioned, the whole is densely wooded, the jungle being impenetrable for more than a few yards, and it is not inhabited.

Sanga Sanga island is about 6 miles long in a north-east and south-west direction, and 3½ miles across at the widest part ; it lies immediately to the northward of Bongao, between it and Tawi Tawi island, and separated from the former by a very narrow passage called by the natives Trusan Bongao, through which there is only a channel for boats of small draught of water. Unlike Bongao this island is not high, has no conspicuous hill on it, and is covered with trees. There are a few small patches of cultivation on the south-east side over Pandan bay, where there is a Panglema or chief, but there is none in any other part of the island.

The channel between it and Tawi Tawi is shallow, and only available for boats or prahus of light draught of water, and its entrance from the northward is almost hidden by the island of Takut Mataha and reefs.

Papabag island lies south of Sanga Sanga, and east of Bongao, and is separated from each by narrow channels, the latter being shallow; the south-west side of this island is well planted with coco-nut trees, but it does not appear to be thickly inhabited. There are said to be numerous wild cattle here, but none were seen during the *Nassau's* visit in February 1872.

Four cables west of the south point of Papabag island is a coral patch of 3 fathoms.

Port Bongao* is formed by the islands Bongao, Sanga Sanga, and Papabag. The village of Bongao was occupied in 1881 by the Spaniards, who have established there a garrison of 120 men. The settlement contains a fort, a store, quarters for the officers and garrison, and a few merchant houses.

Beacons.—Five beacons mark the shoals in the inner port of Bongao in about ten feet at low water:—

No. 1.—Upon the shoal off the north-east extremity of Bongao.

No. 2.—Upon the shoal off the west extremity of Papabag.

No. 3.—Upon the south-western edge of the shoal off Rafuña (Rapina) point.

Nos. 4 and 5.—Upon the north and north-eastern edges of the shoal lying off the north and north-east points of Bongao.

Chongos anchorage (Pandan bay).—On the south side of Sanga Sanga is a snug anchorage, well sheltered from all winds, with good holding ground, taking care if going close in to avoid the rock awash and the 6-foot coral patch in the middle of the entrance. The best anchorage is, however, outside the bay, in from 11 to 13 fathoms, mud, with the Panglema's house (on the east side of the bay) N.N.W. ½ W., and south point of Sanga Sanga W.S.W.

Supplies.—There are no supplies to be obtained, the few people living there being in a state of semi-starvation, their existence almost depending on the few fish they catch.

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* *See* plan on Admiralty chart, No. 2,576, *also* Admiralty chart:—Bongao anchorage No. 1,243; scale, $m = 1$ inch.

Tangao is a small islet covered with trees, about 1¾ miles E. by N. from Papabag island, and has a reef running half a cable to the southward of it, the extreme of which dries at half ebb. There is a clear passage on either side of this islet when bound up to Pandan bay.

A rocky point on the southern shore of Tawi Tawi island, off which a reef runs for two cables, lies 1¾ miles to the eastward of Tangao, while a reef that dries 2 feet lies about three-quarters of a mile to the eastward of the rocky point; from this to Lubukan there are no off-lying dangers.

Lubukan island, nearly 6 miles to the eastward of Tangao, is moderately elevated, and has two remarkable white trunks of dead trees on the highest part. There is no passage between this island and Tawi Tawi, the two being connected by a reef dry at low water; between this and Balambing point is a deep bight with the island of Samanput in the middle, to the westward of which is anchorage in 9 fathoms, mud.

Balambing, a town on the south coast of Tawi Tawi, was destroyed by the Spanish Squadron in 1871, since when, on the smoke of a steamer being seen, the inhabitants take to their boats with all their goods and chattels, and seek refuge in some of the well sheltered creeks that abound to the north-east, and where European boats would find difficulty in following them.

They are pirates when opportunity offers, taking and enslaving the crew of any trading prahu that may happen to be weaker than themselves. This was the great boat-building establishment for nearly the whole of Tawi Tawi, but since the visits of the Spanish gun-boats they have been removed to a place called Lupa Buan, about 10 miles to the north-east.

Anchorages.—There is good anchorage anywhere along the south coast from Bongao to Balambing in about 13 fathoms, sand and coral, muddy bottom being sometimes obtained to the west and south-west of Lubukan island, where the holding ground is good. There is also good anchorage on the Sanguisiapo bank in from 6 to 10 fathoms, sand, but there is none south of a line drawn between the north end of Simonor, and the sand cay on the north end of Tiji Tiji bank.

Supplies.—When anchored north of Laa island in H.M.S. *Nassau*, the natives came off from Simonor in large numbers with fowls, goats, coco-nuts, sweet potatoes, and fish, the whole of which they bartered with the seamen for tobacco, knives, razors, buttons, &c., at a moderate rate of exchange. They did not seem to appreciate money, unless to make ornaments for their weapons.

Tawi Tawi bay.—The interior of this great bay is filled by banks and shoals, with navigable channels between them, too numerous and intricate to describe. By piloting from the masthead, and with the aid of the chart, the navigation is easy; but the sun should be at a good altitude and behind the pilot. It is also essential that the vessel shall be handy, as many of the turns in the channels are very sharp.

Lupa island, to the east of Balambing, is separated from Tawi Tawi by an impracticable channel.

Buan island is in the great bay north of Balambing, and near the coast of Tawi Tawi. It is of some height, well cultivated, and has good water. There is a remarkable tree on the centre of the island. Large vessels can anchor about 2 miles south of Buan in 10 fathoms, while vessels of lighter draught can anchor north of it in 4 to 5 fathoms.

Simanale anchorage is in the northern part of the channel that separates Sanga Sanga from Tawi Tawi. Trusan Bongao island shelters and almost conceals the entrance of this channel, which is 5 cables wide, and 4 to 5 fathoms deep. Within the entrance the port widens; but shoals reduce the available space on either side as well as in the middle; and vessels drawing over 16 feet should moor. In the northern part of the port the depth is 6½ to 9 fathoms, but it shoals to 4½ and 2 fathoms in the southern part.

Winds.—On the coast of Tawi Tawi and at the anchorage south of Bongao, during the months of February and March, the winds were from N.N.E. to N.E., with occasional calms, and light airs from the northward; the squalls from the N.E. blew very heavily at the anchorage south of Bongao.

During April and the early part of May it still blew fresh from the N.E., but after the 6th May calms and light airs were experienced until the end of the month, when it began to blow steadily from E.S.E. to S.E., force one to 3; these south-east winds prevailed in the Sulu sea until July.

Weather.—Heavy showers were experienced in January and February with misty weather; March and April being finer, but the weather was still misty; May was almost free from rain, with the exception of an occasional passing shower, the atmosphere being generally clear; in June it was clear between the passing showers, which were however very heavy and frequent.

Tides.—At Bongao it is high water, full and change at 6h. 40m.; springs rise 6½ feet. The flood stream sets N.W. and the ebb to the S.E. with a force of 3 knots: but it takes many directions round the reefs; and between Simonor and Sanguisiapo it runs like a race with whirls and heavy overfalls even in a calm.

TATAAN or SIMALAK ISLANDS consist of a chain of nine small islands or coral reefs, extending for 8 miles north-east and south-west, nearly parallel to the north coast of Tawi Tawi, leaving between it and them a clear commodious channel about 1½ miles wide, which forms the port of Tataan.

The two Simalak islands are the most easterly of the group; they lie close together, are very narrow, surrounded by a beach broken by mangroves, and are covered by high trees visible 12 miles off. Kabankauan island lies one mile to the south-west, and consists entirely of mangroves on a flooded reef. These three islands rest on a great coral reef which almost dries at low-water, and which extends 1½ miles to the N.E. of Little Simalak. On the northern part of the reef there is a shoal of sand and gravel, visible 4 miles off, which serves to indicate the reef; another shoal on the north-west part is generally covered.

Nusa Lakit, and **Nusa Takbu** are two wooded islands lying one mile west-south-west of Kabankauan. The reef they stand on is separated from those on each side by navigable channels, known as the Nusa Takbu and Basun channels; it extends one mile to the northward of the islands, and has on its north-east end a sand shoal which marks the western edge of the Nusa Takbu channel. To the south-eastward of the islands the reef extends to 2 cables, and has off it a chain of coral patches extending 2 cables farther out, and from one channel to the other, making the approach dangerous.

Basun and **Tinakta islands.**—The Basuns are two wooded islands which lie half a mile west of the Nusa islands. Tinakta, which is covered by tall trees, lies a good mile to the south-west of the Basuns, and on the south-west extreme of the reef on which these three islands stand. The reef which is of sand and coral, with mangrove islets on it, reaches more than half a mile to the north and north-west, and is steep-to; on the northern part there is a cay of broken coral of a glistening white, and visible more than 4 miles off: this cay marks the western edge of the entrance to the Basun channel. To the south-east of the Basuns the reef runs out in two points to a distance of 4 cables.

Sipaiu, the westernmost of the Tataan chain, lies 2½ miles S.W. by S. of Tinakta, and half a mile from the coast of Tawi Tawi, from which it is separated by a clear, deep channel. The island is of clean sand, and in 1885 all the trees upon it, with the exception of four, had been felled. It stands on the southern edge of a coral reef which extends half a mile to the northward and westward, and has on its northern part a bank of sand and coral which serves to mark it.

The channel between Sipaiu and Tinaktu is of uneven depth and has several shoals in it; bottom, sand and coral.

Coast.—Point Bakun, at the eastern entrance of Tataan channel, is a low prominent point covered with tall trees, and surrounded by a reef about 100 yards in extent. Two miles to the eastward is the little bay of Moko, and midway between it and point Bakun a noticeable beach—the rest of the shore consisting of mangroves.

Port Tataan.—From point Bakun the coast trends west-south-west for 1½ miles to the next point, including a slight indentation at the mouth of the river Bakun; from this point, which is opposite Kabankauan island, and is clean and steep-to, the coast trends first S.S.W. for about 2 miles towards the bottom of a bay with two small shoals in it, which uncover at low-water, and then W.S.W. to the settlement of Tataan. The settlement is on a small hill, and consists of a fort, and a few houses for the small garrison.

Anchorage.—The best anchorage is in 9 to 11 fathoms with the mole in line with the fort; further to the westward the depth is 14 fathoms, and here large vessels can anchor. The anchorage is exposed to the gales from S.W. and N.W. which blow in the months of June and December, when a sea sets in; vessels can then anchor to the eastward of Kabankauan where there is shelter from all winds.

Tides.—It is high-water, full and change, at Tataan at 7h. 23m; springs rise 3¼ feet in the equinoxes, and 6½ feet in the solstices: the tidal streams are weak inside the islands.

Supplies.—None can be obtained here, except fish and water: the water is good, but not abundant.

From the settlement the coast, which is thickly wooded, continues W.S.W. for 3 miles to a bay almost closed by a coral reef; it then continues W.N.W., low, wooded, and fringed by a reef that extends out about one cable, to point Bagut Lapit, which is fringed by a reef to the distance of one cable.

Directions.—The north-eastern channel, between point Bakun and the Simalak islands, is the best; it is one mile broad, and 14 fathoms deep in the middle, decreasing on either side to 8 fathoms near the coast, and near the Simalak reef. Within, the channel widens to 2 miles, and the depth in the middle is 16 fathoms. A vessel making for the Tataan anchorage should bring the fort to bear S. by W.; a course for it on that bearing will then pass clear of the westernmost of the two shoals above mentioned.

The Nusa Takbu channel, between Kabankauan and Nusa Takbu, is 3 cables wide and 4½ to 7½ fathoms deep; and runs north and south in a direct line towards the settlement of Tataan. Vessels using this channel can keep a mid-channel course while to the north of Nusa Takbu; but after passing that island the reef of Kabankaban, which is steep-to, should be closed in order to avoid the shoals extending south-east of the Nusa Takbu reef.

Basun channel separates the Basun and Nusa Takbu reefs; its northern entrance is marked by the cay of broken coral already mentioned; the southern part of the channel is dangerous on account of two shoals of 6 and 13 feet off the extremity of Nusa Lakit reef; in taking this channel it is therefore better to keep on the western side. Information is wanting as to the depth of the water in this channel.

Western channel, between Sipaiu and the coast.—In this channel there are two small banks; one covered by 23 feet of water lies 200 yards to the northward of the extremity of the coast reef; the other, of 4½ fathoms, lies 2 cables from the coast in front of the little bay to the eastward of point Bagut Lapit. Between these shoals and Sipaiu islands there is a clear channel with depths of 10 to 16 fathoms. The southern shore of Sipaiu is clean; it is best, therefore, to keep on that side of the channel.

Port Dos Amigas* is situated 6 miles to the eastward of point Bakun. The entrance, between point Tokanhi and Lamnuyan, both of which are clean, is half a mile wide; from here the port runs in to the southward for about 6 cables, and then turns to the north-east for about a mile with a width of 1½ cables, the depth diminishing from 15 to 18 fathoms at the entrance to 8 fathoms at the turning, and to 5½ and 3 fathoms at the bottom of the port. The best anchorage is off the turning in 8 fathoms, sand and mud. There is a good watering-place in the port.

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* There is a Spanish plan of this port.

Shoal.—The chart shows a shoal of 4¾ fathoms about a mile north-west of point Tokanhi.

PANGUTARANG GROUP.—Pangutarang island, the largest of the group, is low and level; little more than the trees are visible above water. It is thickly inhabited, and carries on a brisk trade with Sulu. It was formerly occupied by the Spaniards. The principal place, Maglakob, lies on the east side, some distance inland. The coast near it is enveloped by coral and sand banks, between which there is an entrance at high water into the lagoon formed by the coast and the reefs. The island contains numerous groves of timber and coco-nut trees; the milk of the latter is used by the natives instead of water, which is, in the hot season, very brackish, and during the rainy season nearly black.*

Pandukan is a long island east of Pangutarang, running north and south; like the rest, it is covered with trees, a conspicuous peaked clump on its south end being the highest. The passage between Pandukan and Pangutarang is about 2¼ miles wide.

Kulassein, about 4½ miles north of Pandukan, is joined to it by a chain of black rocks on a bed of white sand. Over these rocks are 6 to 9 feet of water, and between them 3 to 4 fathoms. Captain Sir E. Belcher, in the *Samarang* in 1846, landed on the south-west point, and determined its position.

Caution.—Large vessels should not try to pass between the islands north-east of Pangutarang, for the tide streams have a speed of 6 knots at springs.

Tubigan is a wooded island with a small river and good drinking water.

Teomabul is low and wooded. The reefs of Teomabul extend more than 8 miles to the N.E., and to the E. by S. ½ S. of Kulassein. A reef of 1½ fathoms water lies N.E. ½ N. 10 miles of Teomabul island, and E. by N. of Kulassein.†

Pantokunan has been described in the Sulu group (p. 116).

Pangutarang passage, about 33 miles to the north-east of Laparan island, lies between Pangutarang island to the north, and Ubian and Usada islands on the south; it has an average width of 5 miles, and is very deep. Ubian and Usada are the largest of a group of thickly wooded islands lying to the southward and eastward of Pangutarang.

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* U.S. Hydrographic Notice, No. 91 of 1872.

† The captain of the Dutch barque *Wilhelmina Frederika* reported in 1872 that the reefs on the north side of Teomabul extend 12 miles in a N.N.E. direction.

North-Ubian.—Ubian is about 3 miles long, and 2¼ wide, and is inhabited, the largest town Suang-bunah being on the south-west side, in a deep bight, and well protected by a coral reef. There is another village in the interior named Aloh, which must be well screened from view, as it was not seen by any of the *Nassau's* boats

From Ubian a shallow bank, with from 7 to 11 fathoms over it, runs in a W.S.W. direction for nearly 19 miles to Cap island. This bank affords a good stopping place for a ship taking the Pangutarang passage; its northern edge is very steep, and the lead should be kept going when approaching from this direction.

Malikut, a small island south-west of Ubian, distant about 3½ miles, is a little more than half a mile long by a quarter of a mile wide.

A reef runs a quarter of a mile to the north-west, dry at low-water, and is continued by a bank in the same direction, the 5-fathom limit of which is about N.W. ½ W. 1¾ miles from the north-west extreme of the island.

Tikul lies about eight-tenths of a mile to the eastward of Ubian, with a deep channel between them; it is about three-quarters of a mile long, and off its north end are two sand cays, with trees on them, while immediately south of this point is a lagoon of salt water.

There are paths through this island all converging to a well near the centre; the water however is brackish. The natives of Ubian are said to go to Tikul for water.

Usada, to the south-east of Tikul, is fringed by a reef; there is a lagoon on the western side of the island, with an opening into the sea through the reef, over which native boats run at high water; Usada appears well inhabited from the number of canoes and prahus seen, but no towns were observed on the coast.

Kunilan, the top of the trees on which are 67 feet high, is about 1½ miles south-west of Usada, with a passage between the two islands; it is about a mile long in a north-west and south-east direction, by about half a mile broad.

Bas-Bas, which is about 2¾ miles S.S.W. of Kunilan, is 63 feet high, and covered with trees; in fact, all the low islands of this group appear to have been coral reefs or sand cays originally, as the surface of the soil is not much above the high-water level of extraordinary spring tides.

Anchorage.—There is anchorage between Malikut and Ubian in from 5 to 10 fathoms, but the bottom is hard and even. The *Nassau* anchored 5 cables south of the rocky islets at the entrance of the creek on the south-east side of Usada, in 11 fathoms, sand and coral, but fair holding ground.

There is also anchorage about one mile W.S.W. of the north end of Malikut, in 7 to 9 fathoms, but the tides run strong at springs.

Laparan island is situated 23 miles W.S.W. of Malikut; it runs north and south, is 5 miles long, and from 2 to 3 broad, and covered with trees. To the westward it is fronted by a coral reef with several small islets on it, the reef being steep-to. There is no anchorage to the westward of Laparan.

Dok-Kan is separated from the S.W. extremity of Laparan by a channel about a quarter of a mile wide. In the centre of this island is a large lagoon with several islets in it. A bank with 5 to 8 fathoms extends about 2 miles to the north-west of Dok-Kan island.

Anchorage.—There is anchorage south and west of Dok-Kan, but none north of it; outside the 20-fathom limit the bank is steep-to; on the southern side of the island a ship should anchor directly 9 or 10 fathoms is obtained, as deeper water will be found between those soundings and the edge of the reef.

Tides.—It is high water, full and change, at 6h; springs rise 5 feet. The observation was made at the time of the equinox, when there was only one tide in the 24 hours, and the flood stream ran for 9 hours and the ebb for 3 hours; the flood setting N.N.W., ebb S.W 3 to 5½ miles an hour.

Billanguan island, nearly 18 miles south-east of Dok-Kan, is about three-quarters of a mile long north-west and south-east, and like the majority of the islands in this archipelago, is low and covered with trees.

A bank with about 10 to 12 fathoms extends nearly 3 miles to the southward of this island, where a vessel may anchor if necessary, but the holding ground is not good.

Bambannan, another low coral island covered with trees, is about 4½ miles south-east of Billanguan; it is only visited by the natives of Tawi Tawi occasionally for fishing purposes; off the south side there is anchorage in about 13 fathoms, during the N.E. monsoon.

Uwaan, Mamanuk, and Lahat Lahat, lying to the north-east of Billanguan and Bambannan, are similar to those islands in formation and character, The other islands included between N. Ubian, Laparan, and Bambannan have not yet been surveyed, and vessels should not pass between them.*

The Pearl Bank.—This extensive bank, on which are Taja and Zau islands, is a formation of coral and sand, lying about E. by N. and W. by S., 15 miles long, with an average width of 6 miles, and very steep-to. Nearly in the centre of this is a circular coral reef about 18 miles in circumference, which dries in patches at low-water spring tides. The opening leading into the lagoon formed by this coral reef has a bar extending across it with 9 to 13 feet water.

The reef has several small islands and islets on its west, south, and east sides, the highest (50 feet) being near the south-east extreme; all these are low, covered with bushes, and hardly visible at a distance of 6 miles.

If running down at night to pass either to the east or west of the bank, the soundings would give warning of the vicinity of the central reef, but it is too steep to the north and south for the lead to be of much service unless going very slowly.

Anchorage.—There is fair anchorage on the bank either to the north-east or south-west, in the S.W. and N.E. monsoons respectively, but tides are very strong, running with a velocity of from 3 to 5 knots an hour.

Tides.—It is high water, full and change, at 6h. 5m.; springs rise 5 feet.

Talantam bank is composed of sand and coral, the shoalest part of 5 fathoms being in lat. 5° 42′ 00″ N., long. 119° 26′ 30″ E. It is about 3 miles long north-west, and south-east and 1½ miles wide, with an average depth of 8 fathoms, the above length and breadth being the 10-fathom limit.

With wind against the tide there are heavy overfalls and tide ripplings round this bank, sometimes extending as far as the eye can see, and much resembling broken water.

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* Apo Lambu is said, by Dalrymple, to have been within the memory of man an island with trees on it, but to have been overwhelmed by a storm, and to be covered now, where shoaler, by 4½ fathoms water. Voyage of H.M.S. *Samarang*. Vol. I. page 276.

CHAPTER IV.

NORTH-EAST COAST OF BORNEO. — FROM BANGUEY ISLAND TO SIBUKO RIVER.

Variation 2° 5′ Easterly in 1890.

The territory of the British North Borneo Company includes the whole northern portion of Borneo island from Sipitong river in latitude 5° 6′ N. on the west coast, to Sibuko river on the east coast in latitude 4° 5′ N., including an area of 31,000 square miles.*

This chapter contains the pilotage of the north-east coast of Borneo with the off-lying islands, from Banguey on the north, to Sibuko river n the south, along a coast line of 400 miles. There are several good harbours, the principal one of which is Sandakan, the seat of Government and chief place of trade. Kudat, in Marudu bay, is described in China Sea Directory, Vol. II. The Company has also got settlements at Mitford in Banguey island, Silam and Lahat Datu in Darvel bay, and Simporna in Trusan Treacher.

Climate, Meteorology, &c., from the report of Dr. James Walker, M.D., principal Medical Officer.

The climate of British North Borneo is noticeable for nothing more than for its equability, and the absence of extremes. The temperature, rainfall, winds, natural phenomena generally, and the diseases, are, for a tropical country, of the most mild and temperate types.

Monsoons and Winds.—The north-east monsoon commences about the middle of October, and continues, gradually dying out, till about the middle of April; during the greater part of this time the wind blows steadily and with moderate strength, from the north and east. In the course of this monsoon, more particularly in December and January, there are generally one, two, or three moderate steady gales, lasting from 3 to 9 days; at other times the wind is a moderate breeze, beginning about 11 a.m., getting rather stronger towards evening, and dying away in the early morning, when it may be overcome by a gentle land breeze. At the beginning and end of the monsoon the wind is not so strong or so steady, and the land breeze continues till later in the forenoon.

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* *See* Admiralty charts:—China sea, southern portion, No. 2,660b; *m* = 0·05 of an inch.

Paláwan laland, No. 967; *m* = 0·1 of an inch.

Balábac strait and channel between Borneo and Palawan, No. 948; *m* = 0·5 of an inch.

Borneo, Gaya bay to Sandakan Harbour, No. 287; *m* = 0·24 of an inch.

Sulu Archipelago and the north coast of Borneo, No. 2,576; *m* = 0·1 of an inch.

The south-west monsoon lasts from about the middle of April till the middle of October. The wind as a rule is not so strong in this monsoon; the land breeze in the morning is more marked, and the gales not so strong nor so long continued as in the north-east monsoon. On the other hand, there are frequently squalls in the afternoon and evening, lasting for an hour or two, and sometimes blowing with the strength of a fresh gale. Neither in this monsoon nor in the north-east does the wind rise to the strength of a storm, or even of a whole gale.

Commander Johnston, of H.M.S. *Egeria*, remarks that the prevailing winds in the afternoon during the south-west monsoon on this coast of Borneo, to the north of Tanjong Unsang, are generally east to south; southward of Unsang they are generally more westerly, but always light. Rounding Unsang in the afternoon the *Egeria* found the wind keep ahead following the direction of the land. At night there is generally a land breeze.

Rain-fall.—The annual rain-fall near the coast, according to the records kept, has, during the seven years ending 1885, ranged from 101 to 157 inches, with an average of 124 inches.

The true wet season occurs in the north-east monsoon, and includes the months of November, December, and January, and generally part of either October or February or both. During this wet season the greater part of the rain falls as general rain from a uniform dull grey sky, and is pretty equally distributed between day and night; but the rain is not continuous.

The true dry season immediately follows this true wet season, and includes March and April, and generally the whole of May, and part of February. During this time any rain that falls generally occurs in showers at night or early morning, and no month passes without several showers.

This true dry season is followed by a period of moderate rain-fall, commencing generally about June. The first month or six weeks of this period almost deserve to be called a second wet season, and the rest of the period up to the commencement of the true wet season might be described as a second dry season. As, however, the limits of these two are ill defined, their characters similar, and the difference in rain-fall comparatively small, it is better to consider them together as a sort of intermediate season. During this period the rain falls chiefly in heavy squalls (either with thunder or from thundery clouds), occurring most frequently in the afternoon and evening, but not confined to that time; and it is during these rain squalls that the heaviest falls of rain occur; *e.g.*, as that on the 15th of June 1884, when 2·05 inches fell in forty minutes.

Temperature.—The temperature recorded at the coast has ranged between the extremes of 67·5° and 94·5°; but the difference in temperature between different seasons of the year is very slight. The lowest average temperature (79°) for both day and night is during the wet season in December and January; the highest average temperature during the night occurs during the dry season in April and May (74°); whilst the highest average temperature during the day is in August and September (89°).

The absence of tornadoes, cyclones, and earthquakes is to be noted. The peculiar phenomena of tropical climates generally are found here; thunderstorms with much sheet lightning are frequent during the months from July to September, and are sometimes severe. Mirage is generally present in the afternoon to a slight extent; phosphorescence occurs in great perfection in Sandakan bay.

On the whole the country appears to be fairly healthy for the tropics, less so than Singapore, but much better than the Dutch islands south of the equator. There is certainly a good deal of intermittent fever about, and a great many visitors to the island are attacked; but the type of the disease is not severe, and Europeans rarely succumb to its effects.[*]

Tides.—The wave that enters the Sulu sea from the China sea by Balábac strait and Banguey channel, penetrates as far as Unsang peninsula, where it meets the wave from the Celebes sea, which enters by the Sibutu channel. The time of high water of the wave from the China sea is from 11h. 30m. to 12h. 0m.; and of that from Celebes from 6h. to 7h. The range of the tides is 6ft. 9in. at Sandakan; 5½ feet off Dewhurst bay, and in Dent haven 3 feet.

BANGUEY ISLAND, the west extreme of which lies 2¼ miles east of Balambángan, is 19½ miles long in a north-east and south-west direction, and about 13 miles broad. The island is surrounded by a fringed reef, the south coast being faced by small islands, having deep water channels between, and large concealed spaces behind, which formerly served as the principal rendezvous and hiding places for the Llanum pirate prows, when engaged upon marauding expeditions on the cosats of Borneo and Paláwan, and are not probably even now altogether unused for that purpose; these small islands form part of the northern limit, and are included in the description of Banguey South channel. The west coast is included in the description of Banguey West channel, and the north coast in that of Balábac strait. Off-lying for several miles the north-east and east coast of Banguey are numerous islands, islets, and dangers, some of which will be included in the description of Banguey South channel.

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[*] Seas and Skies in many Latitudes, p. 316, by R. Abercromby.

There are several ranges, also some detached hills, on Banguey; the highest, Banguey peak, 1,876 feet high, is at the north-west end of the island, and shews up as a very conspicuous object for more than 30 miles around. Viewed on a north-westerly, or opposite line of bearing, the apex appears as a sharp nipple, but as this line of bearing is departed from, the nipple shape becomes less apparent, and a shoulder comes into sight; this last, being but little less elevated than the peak, causes the crest of the hill to appear rounded when viewed from long distances. From the peak a long spur slopes in a south-westerly direction to the west coast, and a range of hills extends to the eastward for a distance of 6 miles, East hill at the extreme of this range, being elevated 1,076 feet; thence some smaller ranges lie in a northerly direction, and terminate near the coast in North hill, 742 feet high. About 1¼ miles south-eastward of Banguey peak is a conspicuous hill 1,480 feet high, from which a lower range extends 2 or 3 miles to the southward, where it curves in a south-easterly direction.

Balambangan island is described in China Sea Directory, Vol. II., only the dangers on the northern side of the island, which affect Balábac main channel, are included in this work (p. 155).

BALABAC STRAIT, leading from the China sea into the Mindoro or Sulu sea is bounded on the south by Balambángan and Banguey islands, and on the north by Balábac island. The greater part of this strait is occupied by coral dangers far too numerous to admit of detailed description. These dangers are divided into groups, each group being distinguished by a special denomination—such as Mangsi danger bank, Great danger bank, &c. This arrangement distinctly defines the limits of the various channels between the dangers.

The high peak of Balábac strait island is the most conspicuous object in the vicinity of the strait, and visible from all parts of it

Banguey and Balábac peaks lie N. ½ W. and S. ½ E. from each other, 37½ miles apart, and as most of the dangers and channels are to the eastward of that line, these peaks are of the first importance for determining the position of vessels when navigating this dangerous strait.

Balábac island is out of the scope of this work; navigators are referred for its description, and that of the dangers in its vicinity, to the China Sea Directory, Vol. II. For the convenience of navigators entering the Sulu sea from the westward, the main channel of Balábac strait is included here; the other channels, which are less often used, will also be found in the same volume of the China Sea Directory, Vol. II.

The MAIN CHANNEL through Balábac strait is limited to the southward by the danger line, encompassing the reefs and shoals lying off the north and north-east coasts of Banguey (*see* page 155); and to the northward by Mangsi Great reef, the southern part of which is 1½ miles distant from the edge of the bank on the Banguey side. The depths in the channel are not regular, varying from 14 to 23 fathoms, the deepest water being rather nearer the reef than the middle of the channel.

Mangsi Great reef, situated 4½ miles northward of North Guhuan, and a little over 3 miles, in the same direction, from the Louisa shoal, is 5 miles long E. by N. and W. by S., and 2¾ miles broad. It is nearly everywhere covered at high water, but a sand cay upon the eastern part is generally visible from aloft when near the edge. At low water the reef presents a vast expanse of coral and sand, with lagoons here and there.

From the west end of the reef shoal water, under 10 fathoms, extends about 2 miles in a W.S.W. direction; the soundings over this part are very irregular, and, although the least depth known is four fathoms, the locality should be avoided. From the outer part of this shoal water Banguey peak bears S.S.W. ⅛ W., and the apex of North Mangsi island N.E. by E. ½ E. At the south-west part of the reef the 10-fathom line is more than half a mile off, but along the southern edge its distance varies from one to 4 cables. At the eastern side, shoal water under 3 fathoms projects half a mile in the direction of the Mangsi islands; and similar shoal water, but extending only half as far, fronts the whole northern edge of the reef; at the north-east part, the 10-fathom line is 6 cables distant.

Mangsi Danger bank, situated about 1¾ miles north-eastward of Mangsi Great reef, includes within its limits the Mangsi and

Salingsingan islands, with the extensive dangers adjacent, also Loxdale and Jessie shoals, besides many smaller. This bank is 10 miles long E. by S. ½ S. and W. by N. ½ N., and 4½ miles broad at the eastern end, tapering to a point at the opposite extreme.

South Mangsi island, covered with trees, is round shaped, about half a mile in diameter, and stands upon a reef which extends from it a mile eastward, 6 cables westward, half a mile south-eastward, and less distances in other directions.

North Mangsi island, situated half a mile north-westward of South Mangsi, is covered with trees, which rise to an apex near the centre, 130 feet above the level of the sea. The island is nearly three-quarters of a mile long and about a quarter of a mile broad; from its east end reefs and shoals extend—beyond those projecting from South Mangsi—for a distance of 2¼ miles, and some patches of 4 to 7 fathoms half a mile farther in an easterly direction: from the west end a line of reefs and shoals extend in a W. by N. ¾ N. direction, nearly 3½ miles.

Jessie shoal, with 6 feet water, lying 2½ miles E. by N. from North Mangsi island, is 1½ miles long, E.N.E. and W.S.W., and half a mile broad. This danger is situated at the east part of the bank, and shoals extend from it in a south-easterly direction: from a depth of 10 fathoms near the extremity of these shoals, Salingsingan bears N.W. by W. ¾ W. 4¼ miles, and the left extreme of South Mangsi island W.S.W. 3½ miles.

Salingsingan island is composed of coral and sand, covered with trees; it is rather more than half a mile long, N.W. by W. ½ W. and S.E. by E. ½ E., and 200 yards broad at its west end, tapering to a point at its east end; from which a reef extends 4 cables in a S.E. by E. direction; but from other parts, only a short distance. A shoal, nearly awash in parts, stretches off three-quarters of a mile eastward, and, 1¾ miles westward, from the island, the breadth of the latter being nearly a mile; another shoal, separated from it by a narrow deep-water passage, and extending off nearly three-quarters of a mile N.W. by W. from the island.

Loxdale shoal, forming the west end of the bank, lies 1¼ miles westward of the dangers extending from the islands of North Mangsi and Salingsingan, the depths between being from 22 to 34 fathoms. It is a coral shoal, nearly 1¾ miles long, E. ¾ N. and W. ¾ S., half a mile broad at its eastern part and 3 cables at its opposite end; over it are 2¼ to 3 fathoms water, the shoalest part being at the north-east extreme, close to which are 24 fathoms, and close to the east extreme

16 to 30 fathoms; elsewhere soundings of 4 and 5 fathoms extend off a short distance. From the west end of this danger Banguey peak bears S.S.W., South Mangsi island S.E. by E. ½ E., and Salingsingan E. ¼ S.

Kestrel rock.—H.M.S. *Kestrel* passed over a shoal with 5 fathoms water, in the east entrance to main channel; from the patch, Banguey peak bears S.W. by W. ¼ W., and the west extreme of south Mangsi island N.W. by W. ¾ W.

Soundings of 8 fathoms were obtained by H.M.S. *Comus*, 1882, on a shoal about one mile south of Kestrel rock.

Directions.—Vessels coming from the south-westward, and bound through Balábac strait, during the north-east monsoon, will find Main channel the most convenient, attending to the following directions:—When nearing the north-west part of Balambángan island, do not bring point Buttun to the westward of S.W. ½ S., nor come into less than 14 or 13 fathoms, in order to keep clear of the dangers extending from the shore, and of the Siagut shoal (*see* page 155). Siagut point, the north point of the island, must not be approached nearer than 2 miles, nor under a depth of 8 fathoms; North hill, on the north part of Banguey, if not brought to bear eastward of E. by S. ¼ S. will lead half a mile outside all the dangers off Siagut point, as also those extending north of Tiga islet, which last should not be neared to a less distance than a mile, or under a depth of 8 or 7 fathoms. From Tiga islet the Banguey coast may be approached to 9 or 8 fathoms, until North Guhuan bears about S.S.E., when vessels should not come into less than 12 fathoms. The light green colour of the water over Great Mangsi reef will, even at high tides, enable a good look-out aloft to make out the edge sufficiently far off to permit of a vessel being guided past it at a safe distance; and when on the south side of the channel the first cast of 10 fathoms, or under, will denote the edge of the bank. Having brought the apex of North Mangsi to bear westward of North, to clear Banguey Outer North-east reefs care is necessary to avoid bringing North hill to the westward of S.W. by W. ½ W. until the west extreme of North Mangsi is shut in behind South Mangsi.

Coming from the Sulu sea the Mangsi islands should be made bearing about West, when a course about W.S.W. will lead to the entrance of Main channel. If, however, the channel should be made more from the southward, as the apex of North Mangsi begins to shut in behind the southern island, and the soundings be 14 or 13 fathoms, a vessel will be towards Banguey Outer N.E. reefs and care must be taken to bring North hill of Banguey to the southward of S.W. by W. ½ W. before proceeding further to the westward. ee

MANGSI CHANNEL, separating Mangsi Great reef from Mangsi Danger bank, is a mile wide at its narrowest part, where the depths are irregular, there being 14 to 17 fathoms near the reef and 24 to 33 towards the Mangsi Danger bank.

Directions.—Navigators will rarely have occasion to use this channel, but in case of necessity the following directions may be of assistance:—Coming from the westward, and having sighted the Mangsi islands, bring the centre of South Mangsi island to bear E. by S. and steer for it, carefully preserving the bearing; when the west end of North Mangsi bears N.E. by E. ¾ E. steer S.E. by S., passing midway between the islands and Great reef. With a vigilant look-out no difficulty will be found in passing safely through this channel.

Coming from the eastward a vessel must be guided by the look-out alone to the entrance of this channel, thence pass through the middle, steering a N.W. by N. course; and when the west end of North Mangsi bears N.E. by E. ¾ E. and the centre of South Mangsi E. by S., steer W. by N. out of the channel.

NORTH COAST OF BALAMBANGAN ISLAND.—Siagut shoal, lying 2 miles from the north-west part of the island, is a detached coral bank, 1½ miles in length, with less than 6 feet water over some parts of it; by keeping in depths not less than 14 or 13 fathoms all these dangers will be avoided.

Reefs and shoals extend more than three-quarters of a mile from Siagut point, the north extreme of Balambángan island, and a 3-fathom patch lies N.N.W., nearly 1¼ miles from it: vessels should therefore when rounding Siagut point give it a berth of 2 miles, or not come into less than 9 or 8 fathoms water.

Tiga islet, situated in the northern entrance of Banguey west channel, is low and covered with trees, with a sand cay close to the eastward of it; the islet is a little over half a mile long, a quarter of a mile broad, and surrounded by reefs extending more than a mile in a northerly, and about three-quarters of a mile in other directions; it must therefore be approached with caution.

NORTH and N.E. COASTS OF BANGUEY.—Between Samarang point and the north point of Banguey the coast recedes, forming two bays, each having a small stream running into it; the points and the sides of the western bay are fringed with coral extending one to 2 cables from the shore, but the head of it is a coral and sand beach: vessels may anchor in the entrance of the bay in 4 fathoms, or further in, if necessary, the soundings decreasing regularly towards the beach. The eastern bay, with the exception of a narrow boat passage, is blocked with coral, upon the outer part of which, fronting the bay, is a small islet.

North Guhuan islet stands on the western part of a reef three-quarters of a mile in extent, situated nearly a mile off the north point of Banguey, and 5½ miles E. by N. ⅜ N. from the sand cay off Samarang point.

Westward of North Guhuan there are no off-lying dangers; and the soundings, under a depth of 10 fathoms, decrease regularly towards the shore.

The coast from the north point of Banguey trends E. by S. 2½ miles, S.E. 1¼ miles, thence sharply to the southward, forming the east coast of the island.

Off-lying dangers are numerous, and extend 5 to 6 miles from the north-east part of Banguey. The limits of these dangers, and the greater part of the reefs and shoals in the vicinity of Balábac strait, are depicted on the chart by a pecked line, within which vessels should not pass.

A shoal bank extends from the reef surrounding North Guhnan in an E. ¾ S. direction, 4½ miles; from its centre a tongue, which partially dries, projects half a mile to the northward, with a depth of 3 fathoms, E. by N., a quarter of a mile from the extreme. Two sand cays, surrounded by reefs, lie at the eastern end of this shoal bank, between which and the shore dangers there are depths of 4 and 5 fathoms.

Louisa shoal, composed of coral, with 9 feet water, is three-quarters of a mile long N.W. and S.E., and nearly half a mile broad; from its north extreme North Guhuan bears S. by W. ¼ W., distant 1½ miles, and from its west extreme Samarang point S.W. by W. ¼ W. nearly 6 miles. Manyangit and Samarang points in line, bearing S.W. ¾ W., lead half a mile outside this danger.

Maggie reef, situated E. by N. a little over 2½ miles from Louisa shoal, is composed of coral, a quarter of a mile long, dry at low water, and stands on the northern part of a coral shoal, about 3 miles in circumference, having upon it several rocks, just below water. This reef is N. by E. about 2 miles from the sand cays before mentioned; but the channel between the shoals, on which the reef and sand cays stand, is not quite 1¼ miles broad: from the outer edge of Maggie reef shoal North Guhuan bears S.W. by W. ½ W. 4½ miles; the same object bearing S.W. by W. leads half a mile north-westward of it; and East Guhuan bearing S.S.E. ½ E. leads eastward.

Black Watch rock, on which the British bargue *Black Watch* is reported to have struck, 1878, lies just within the danger line depicted on the chart, 2 miles north of Maggie reef.

From the position of this rock, as given by the master of the *Black Watch*, North Mangsi island is seen open of South Mangsi island, bearing N. ¾ E., and the cay on Banguey Outer north-east reefs, S.E. ¾ E.

From the irregularity of the soundings near this suspected locality it is possible that shallow coral heads may exist.

The Soundings north-eastward of North Guhuan are very irregular under a depth of 10 fathoms; near the edge of the danger line depicted on the chart, to the northward of Louisa shoal there are depths of 5 fathoms, with 12 and 13 fathoms a short distance to the southward. Between Louisa shoal and Maggie reef are several 3½, 4½, and 5-fathom patches, with 6 to 9 fathoms close around. A small patch of 5½ fathoms lies on the northern edge of the bank, near Black Watch rock, with 12 fathoms close to the northward: from this patch North Guhuan bears S.W. ⅛ S.; the right extreme of South Mangsi N. by E. ¼ E.; and East Guhuan S.S.E. ¼ E.

East Guhuan islet, about a quarter of a mile in extent, stands on the west side of a coral shoal which extends nearly half a mile north-westward, 3 cables north-eastward, and nearly a mile south-eastward from the islet. The north-west part of the shoal mostly dries, but over the north-east part, which is a narrow spit, are 18 feet water. About a mile N.N.W. of East Guhuan islet lies a 9-feet patch, about 3 cables in extent; and less than 2 cables southward of the islet is a small patch with 9 feet water, and 4 to 5 fathoms close to.

Banguey Outer N.E. reefs are a cluster of reefs and shoals separated from Maggie reef and East Guhuan islet by a channel, three-quarters to 1¼ miles wide, with depths of 7 to 10 fathoms; these reefs are 3½ miles long in a N.W. ½ W. and S.E. ½ E. direction and a little over a mile broad. A large reef occupies the centre of the cluster, and dries within three-fourths of a mile of each end; upon the north-west extreme of the reef is a sand cay, which is very useful for pointing out the locality of these dangers, which lie 6 miles from the shore. Shoal water extends nearly a mile eastward of the cay, but only a short distance from the west side; close to the edge of these shoals there are 11 or 12 fathoms water.

BANGUEY EAST COAST and DANGERS.—The east coast of Banguey is fronted by dangers which extend off several miles; they consist, for the most part, of extensive reefs, dry at low water, separated from each other by narrow channels.

Kahamkamman is a small islet 2 miles south-eastward of East Guhuan; it stands near the north-west end of a coral shoal about a mile in extent, the part surrounding the islet drying at low water.

South-westward of this shoal, and separated from it by a 5½-fathom channel, about half a mile wide, is another shoal about three times as large, having three islets, a sand cay, and several extensive patches of reef (dry at low water) upon it; the islets lie nearly in a N.E. and S.W. direction, the north-easternmost being the largest, and Balundangan, the south-westernmost, the smallest. A mile south-westward of Balundangan, and 3 cables inside the edge of the reef fronting the Banguey shore, is an island about 1¼ miles long and half a mile broad, with an apex near its centre; this island lies rather more than half a mile off the coast, which is covered with mangrove.

Samson patches, three in number, have 3½ to 5 fathoms water on them; they lie eastward of Kahamkamman near the 10-fathom line defining the edge of the shoal bank extending from the shore close outside of which are 14 to 16 fathoms; from the outer patch Kahamkamman bears W. ¼ N., 3 miles, and the apex of Latoan S.W. ¾ S., nearly 5¾ miles.

May Williams shoal, situated W.N.E., nearly 3 miles from Latoan island, is 9 cables long N.W. and S.E., and 4 cables broad, having 2½ to 3 fathoms water over it; from its south-east end Kahamkamman islet bears N.W. ¾ N., distant 2 miles, and the apex of Latoan S.S.W. ½ W., distant 3½ miles; around the shoal are depths of 7 to 9 fathoms.

Bankawan and Lotoan islands and reefs comprise five islands, several extensive reefs, and many small detached dangers, the whole forming a group 7 miles long North and South, and 5½ miles broad. Boats only can pass between the various reefs comprising this group, but between them and the reef fronting the Banguey shore there is a deep-water channel through which it is possible for small vessels to pass, although near the west point of Bankawan the channel is narrowed to little more than a cable by a small reef in the middle.

Bankawan, situated about a mile from the east coast of Banguey, is an irregular shaped flat island, 2¼ miles long North and South, and 1¾ miles broad; having close to the east side an island, with an islet off its north-east point; and a little more than a mile south-eastward of it, a small round island, from which a narrow tongue of sand projects three-quarters of a mile in a south-easterly direction. From the south point of Bankawan numerous small reefs extend for about two miles, which with the reef extending half a mile south-eastward of the tongue of sand, form the northern limit of Bankawan channel.

Latoan, 1½ miles north-eastward of Bankawan, is an oval-shaped island, a mile long N.W. and S.E., the trees upon it rising to an apex near the centre. It is situated at the south-west part of a dry reef, which extends 2½ miles eastward, 1½ miles north-eastward, and 1½ miles northward of it. A large reef lies to the westward of Latoan, upon which trees are growing.

East Banguey patches are two small coral shoals lying three-quarters of a mile and a mile, respectively, outside the Bankawan reefs; the western patch has 12 feet upon it, and the eastern 16 feet; from which Latoan apex bears W.N.W. 3¾ miles, and the south-east extreme of the round island (south-eastward of Bankawan) S.W. by W., 4¾ miles.

Outer Latoan patch is the easternmost of three isolated patches which lie close to the north-east edge of the large reef surrounding Latoan; it is about 2 miles in circumference, with 6 to 18 feet water in most parts, and a rock, a few feet under water near its eastern edge; from which Latoan apex bears S.W. by W. ½ W., 3¾ miles.

BANGUEY SOUTH CHANNEL, leading from the China into the Sulu sea, is somewhat intricate, and requires careful navigation, being for the greater part of its length bounded by dangers. The western entrance, about 1¾ miles wide, lies between Outer shoal, the northern-most of N.W. Borneo dangers and Molleangan islands. The southern limits of the channel are formed by the N.W. and North Borneo dangers; South channel dangers; the reefs off the northern part of Mallawallé; Mallawallé Eastern dangers; and Fairway shoal, The northern limits of the islands which lie close to, and appear to be part of, the southern shore of Banguey; Carrington reefs; and S.E. Banguey dangers.

Molleangan island, 466 feet high, situated 1¼ miles south-westward of the south point of Banguey, is 1¼ miles long east and west and three-quarters of a mile broad, with rocks and shoals extending three-quarters of a mile in a north-west, west, and south-westerly direction; the south-east and north-east sides of this island are steep-to. Several shoals with rocks above and below water lie nearly midway between Molleangan and Banguey. At one mile south-west of Molleangan, lies Little Molleangan island, from which dangers extend a third of a mile eastward, and three-quarters of a mile westward, with 13 to 17 fathoms close to.

SOUTH COAST of BANGUEY.—Patanunam island, three-quarters of a mile eastward of the south-west point of Banguey, is more than half a mile in extent, and 428 feet high; the summit is a useful object for determining a vessel's position when passing through the channel. The island is fringed by a narrow belt of coral projecting 2 cables from its south-west end, whilst off the north-east end a detached narrow reef extends nearly a mile in that direction.

Pagassan island, hilly in character, is about 2 miles in extent, and fringed by a reef which projects 3 cables from the southern part, and a cable farther off lies a rock awash; the island must therefore be approached cautiously.

Lampassan island.—Three-quarters of a mile eastward of Pagassan is Lampassan, the southern part of which extends thence 2¾ miles in a E.N.E. direction. This island is also high, and from its southern and eastern points some peculiar spits of coral, dry at low water, project nearly three-quarters of a mile.

Mitford harbour,* where a settlement has been formed by the North Borneo Company, is situated on the south side of Banguey island, and lies inside the three islands just described. There are three entrances to it. The middle and principal entrance is nearly one cable broad at its narrowest part, and has depths varying from 5 to 12 fathoms. There are 4 to 10 fathoms in front of the proposed site of the town, but this part of the harbour is small, and has a dangerous reef near the wharf. The western entrance has depths of 8 to 9 fathoms, but is obstructed by a reef. The eastern entrance is 1¾ cables broad and has a depth in it of 7 to 8 fathoms; a good passage leads from here to the proposed site of the town. Beacons have been placed on the reefs of the middle and western channels.

Water.—The water supply is reported to be good.

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* From a report by Mr. John Robertson, Assistant Surveyor to the British North Borneo Company, 1886. *See* Admiralty plan :—Mitford Harbour, No. 1220; scale, $m = 5{\cdot}7$ inches.

Directions.*—**Middle channel.**—Two palm beacons surmounted by small white flags, mark the 4 and 5 fathom patch, one mile S.E. of the entrance, and S.S.W. of Pagassan island. A vessel should pass between these beacons, then steer a course for the entrance, passing between each pair of beacons as they are met with; when inside the islands, steer for the end of the pier.

Removed

The western entrance is not recommended.

South-east part of Banguey.—A short distance eastward of Lampassan a point extends from Banguey towards the channel, forming one side of a deep inlet, the other side being a peninsula forming the south-east end of Banguey. A short distance off the point, on the shore reef extending from it, lie two islets, and from these a number of rocks, nearly connected, extend in a S. by W. direction nearly 1½ miles; from the outer or southern rock, the east end of Lampassan island bears N. by W. ¼ W., 1¼ miles. The inlet just mentioned is blocked, and the south-east extreme of Banguey bordered by coral reefs, outside the edges of which, opposite the mouth of the inlet, lie two large detached patches, the south end of the outermost being a mile from the shore reef.

Carrington reefs, situated about 2½ miles from the east end of Lampassan, are composed of coral, for the most part dry at low water; they extend 4 miles in an E. by N. and W. by S. direction, and are one mile broad; at 4 cables from the north side of these reefs is a detached shoal of 2½ fathoms. Between this shoal and the dangers extending from the Banguey shore is a channel three-quarters of a mile wide, but which, as a matter of ordinary navigation, no vessel would require to use. It is, however, practically available for small steam-vessels, which may afterwards round the Carrington reefs and return into Banguey South channel; or they may proceed into the Sulu sea, either by the narrow and intricate passage between the shore reefs and those surrounding Bankawan and Latoan, or by Bankawan channel, a broader and much less intricate passage separating the Bankawan and South-east Banguey dangers.

The main channel, however, lies between the Carrington reefs and those off the north part of Mallawallé, and this channel only should be used by strangers, taking care not to near the former dangers under a depth of 15 or 13 fathoms: the apex of Pagassan bearing W. ½ N. leads close to the southward, and the east end of Lampassan N. by W. ¼ W. leads westward of a 4½-fathom shoal lying 3 cables from the west end of Carrington reefs.

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* Lieutenant F. C. T. Jones, H.M.S, *Zephyr*, 1886.

SOUTH-EAST BANGUEY DANGERS comprise an extensive group of reefs and shoals 10 miles long, E. by N. ½ N., and W. by S. ½ S., and nearly 5 miles broad, situated 1½ miles eastward of Carrington reefs. The west end of the group is defined by two small isolated reefs, dry at low water and steep-to; the northern reef lies about half a mile, and the southern somewhat more from the body of the dangers, with depths of 12 fathoms between: a good look-out is essential when nearing them, and the same precaution will have to be observed when passing through the channel, as the reefs forming the southern edge of these dangers are all steep-to. A space, about 2 miles in extent, at the eastern part of South-east Banguey dangers, is studded by a number of coral patches with 1¾ to 3¾ fathoms water, and from the outer, or eastern one, the apex of Latoan island bears N.W. by W. ⅝ W., 9½ miles; Banguey peak W. by N. northerly, 24 miles; and the apex of Mallawallé S.W. ¾ W., 14 miles.

Bankawan channel, separating Bankawan reefs from South-east Banguey dangers, is three-quarters of a mile wide at its narrowest part, near the middle. The channel is nearly straight, and lies in a N.E. ¾ E. and S.W. ¾ W. direction; but it will be necessary to be guided by a vigilant look-out for the reefs on each hand bounding the channel: with proper precautions there will be no difficulty in taking a vessel safely through.

N.W. and NORTH BORNEO DANGERS.—Lying off the north-west and north coasts of Borneo are a number of coral shoals, generally of small extent, some partially dry at low water, whilst others dry entirely, and two are marked by sand cays, which shine brightly in the sunlight. Those dangers only will be described which limit the channels proper for vessels to proceed by; to describe the others in detail would tend rather to confuse navigators, who can have no inducement to risk the safety of their vessels by venturing amongst them. Small vessels may, perhaps, have occasion to venture there when in pursuit of pirates, but they will be more safely guided by attention to the chart than by any description of these dangers.

Outer shoal, the largest of these dangers, forms the south-west limit of Banguey South channel; it is about a mile in extent, with 6 feet least water, and a patch which dries near its eastern side. The north-west end of this shoal has 13 fathoms close to, and from it the apex of Little Molleangan bears N.E. by N., 2½ miles; and a small islet close to the north-west point of Borneo, having upon it a white patch which shows like a boat's sail, bears S.E. ⅜ S., 5 miles.

A sand cay, on the east side of a coral ledge nearly awash, lies E. by S. ¼ S., 2¾ miles from the north-east extreme of Outer shoal, and S.E. by S. southerly, nearly 3¼ miles from Little Molleangan.

Nearly mid-way between Outer shoal and this sand cay is a small coral patch with only 6 feet water, and 15 to 28 fathoms close around.

Another small sand cay, in the centre of a coral ledge, lies East, 3¾ miles from Outer shoal, and S.E. ¼ E., 3¾ miles from Little Molleangan. These cays are useful as marking the limits of the channel, in the direction of Borneo, and being composed of white coral sand, are very conspicuous.

Nearly 3 miles E.N.E. from the sand cay last mentioned, is a 2-fathom coral shoal, with two ledges which dry, a short distance southward; from this shoal, which is the most northerly of North Borneo dangers, Little Molleangan bears W. by N. ½ N., 5¾ miles, and the apex of Patanunam N.N.W. ¼ W., nearly 4 miles.

About 1¾ miles E. ¼ S. from the 2-fathom shoal is the outer of two coral ledges lying close together; from it Little Molleangan bears W. by N., 7½ miles, Patanunam apex N.W. ¼ W., 5 miles, and the highest apex of Mallawallé E. ¾ N., 8 miles. A 3-fathom patch lies 3 cables E.S.E., and a ledge of rocks a little over 1½ miles in the same direction from these dangers; this ledge, however, should properly be considered one of the dangers off-lying the north-east coast, and affecting the navigation of the channel between Borneo and Mallawallé.

SOUTH CHANNEL DANGERS comprise five coral shoals which lie nearly midway between the Banguey and Borneo coasts limiting Banguey South channel to the southward, and Mallawallé channel to the northward. Three of these shoals lie in an E. by N. and W. by S. direction, about half a mile apart: the westernmost is more than half a mile in extent, and dries near the centre; the middle shoal is half the size of the westernmost, and dries near the centre at low water; the easternmost shoal is a strip of coral nearly three-fourths of a mile long, and 2 cables wide, having a rock just under water at its eastern extreme; the fourth, a 2½-fathom shoal, lies S. by E. ½ E., 6 cables, and the fifth, a similar shoal, with the same depth of water, N.E. by E., 1½ miles from the rock on the easternmost shoal of the three first described. Between the different dangers are passages which it is possible for vessels to pass through, but, as this would serve no useful purpose, it is only necessary to consider these shoals as a dangerous group.

Clearing Marks.—The apex of Molleangan island W. by S. leads north; the same object W. ¼ N. leads south; the south apex of

Pagassan island N. ¼ E. leads west; and the islet next the point of Banguey, east of Lampassan, N. ¼ W. leads east of South channel dangers.

Mallawallé island, 7 miles distant from the south-east part of Banguey, and the same distance E. by N. from the north extreme of Borneo, is of very irregular shape, 5 miles long in a north-westerly and south-easterly direction, and about 4 miles broad. The island for the most part consists of ranges of hills from 400 to 500 feet high; but one range, towards the north-west end, attains the elevation of 562 feet. Close to the coast, on the west side, is West island, which, with two islets south-eastward of it, appears to be part of Mallawallé; N.W. islet lies a short distance off the north-west end; and North island, low and nearly a mile in length, almost joins the north part of the main island.

MALLAWALLÉ EASTERN DANGERS comprise a large number of detached reefs and shoals which extend 10 or 11 miles in an E.N.E., East, and S.E. direction from Mallawallé. It is only the northern edge of these dangers, bounding the eastern part of Banguey South channel to the southward, which require description, for there can be no object in risking a vessel amongst them. Should occasion arise for taking a vessel through these shoals, it could only be done, with a reasonable chance of safety, by proceeding cautiously, guided by a vigilant look-out from aloft.

About 2¾ miles N.E. by E. from the detached cay off the eastern end of Mallawallé island is a small coral reef which dries and has depths of 14 and 15 fathoms close around. One-third of a mile southward of this reef is a shoal half a mile in extent, with less than 6 feet water over it. A cluster of reefs and shoals, occupying a space 1¼ miles in extent, with 13 fathoms close to on their northern side, lies a mile eastward of the coral reef just described; and E. by N. ½ N., 3½ miles from the same danger is a shoal half a mile in length, with only 7 feet water on its northern end. This danger, being always covered, is not so readily seen as the others, and it is important to bear this in mind, as the shoal occupies a prominent position, bordering as it does on the deep water of Banguey South channel.

The Straggler, a small coral islet, with trees 20 feet high, is a very useful object for guiding strangers into, and assisting them in navigating, the eastern part of Banguey South channel. From it the 7-feet shoal just described lies N.W. by W. ½ W. nearly 1½ miles, whilst westward of the islet are several other dangers. The reef surrounding the islet extends 1¼ miles in an E. by N. ½ N. direction, but only a short distance in other directions. About 1½ miles S.E. from the east extreme of the Straggler reef, and E. by S. ½ S. from the islet is the outer edge of a shoal having in some places less than 6 feet water. This is the north-eastern danger of the Mallawallé group, and half a mile eastward of it is a 3¼-fathom coral patch. Other dangers of the group extend 7 miles further to the southward, which was the limit of the *Rifleman's* survey in a south-east direction from Banguey.

Fairway shoal, at the eastern entrance of South Banguey channel, is three-quarters of a mile in diameter, with 9 feet least water, and a rock awash near its southern part; its southern extreme lies N.E. ¼ E., 2½ miles from the Straggler, but only 1½ miles N.N.E. ½ E. from the eastern extreme of Straggler reef, which limits the width of the channel southward of the shoal; the channel northward of the shoal is 3 miles wide. From the eastern part of this shoal the highest part of Mallawallé bears W. by S. ½ S. southerly, 14½ miles, and Banguey peak W. by N. ¾ N., 28 miles.

Directions for Banguey South channel.—Having rounded Sampanmangio point, steer to the eastward for Molleangan islands (*see* page 159), and when within 2 or 3 miles of them, open Little Molleangan west of the apex of Molleangan island, and steer east into the channel; being careful not to open the whole of Patanunam—a black round-looking island when viewed from near the entrance of the channel—east of Molleangan island, until the apex of Little Molleangan bears N.N.E., which will lead clear of Outer shoal. Having passed Little Molleangan, steer more to the north-eastward, keeping a mile or so off Molleangan and Patanunam; having passed those islands, bring the apex of Patanunam to bear W. ¾ S. and steer E. ¾ N. through the fairway between the South channel dangers and the rock off the south end of Pagassan, until the summit of the hill at the southern part of Pagassan bears W. ¾ N., thence steer East for a mile or so, until the bearing changes to W. ½ N. northerly, when an E. ½ S. southerly course will lead clear of the dangers off the north part of Mallawallé, until the highest hill of Mallawallé bears S.W. ½ S., then steer a little to the southward—to give a wider berth to the south-east Banguey dangers—until the hill bears W.S.W., when an E.N.E. course will lead between the outer part of the south-east Banguey dangers and Fairway shoal, and out of the channel into the Sulu sea.

In the directions for Banguey South channel, given above, such bearings have been selected for the safe conduct of vessels as are most available for that purpose; but, although it can hardly be necessary, it seems prudent, in view of the exceptionally dangerous character of the navigation, to remind seamen that those bearings should not, and cannot, be relied upon in the sense that objects in line can be, especially when the objects are distant; they will serve, very usefully, to assist in the safe guidance of vessels, but attention to them must be supplemented by a most vigilant and careful look-out from aloft. The best time for proceeding through from the westward is with the sun astern, when there is seldom much difficulty in making out the various dangers as the vessel advances.

Meander patch.—This dangerous reef, the centre of which is E.N.E. 17 miles from the east end of Mallawallé, is composed of large detached masses of coral interspersed with sand, and has only 11 feet at low water. It is nearly half a mile in extent, with deep water close to; about a mile to the westward is a patch of from 3 to 4 fathoms.

The Pudsey Dawson Dangers are a series of coral patches, the western of which, with 15 feet, bears E. ¾ S. nearly 19 miles from the east extreme of Mallawallé island in Banguey South channel; from this danger, on the bearing of E. by N. ½ N. for about 13 miles are several banks with from 2½ to 10 fathoms on them.

These banks are principally coral and sand, with deep water between; as a general rule they are not steep-to, and thus, if the lead be kept going, warning of their vicinity will be given.

A patch of 6½ fathoms was sounded on in latitude 7° 3′ 36″ N. and longitude 117° 56′ 24″ E.

Between the parallels of 7° 00′ and 7° 25′ N., and the meridian of 117° 56′ E., and the east of Banguey dangers just described, are several dangerous coral patches; on some of them there is as little as 10 feet.

If bound northward and in the vicinity of Kagayan Sulu, by keeping that island in sight until the parallel of 7° 25′ is reached, all these dangers will be avoided, and a ship may then steer for Balábac main channel.

The existence of the three undermentioned shoals has been recently reported by the Commander of H.M.S. *Wanderer*:—

(i.) A bank, with depths of 12 to 17 fathoms on it; approximate position, lat. 6° 48′ 45″ N., long. 118° 5′ 30″ E.

(ii.) A bank, with depths of 5½, 6¾, and 8 fathoms on it; approximate position, lat. 6° 43′ 30″ N. to 6° 42′ 00″ N., long. 118° 5′ 30″ E.

(iii.) An extensive shoal, consisting of several patches, with deep water between them, lies south-eastward of the above bank. The least depth found was 12 feet (low water springs) in lat. 6° 42¼′ N., long. 118° 6′ E. (approximate).

Note.—Less water may exist on these banks.

The Muligi patches consist of a number of coral banks with from 5 to 10 fathoms; the shoalest lies W. ¼ N. 26 miles from the great Muligi island.

There is probably less water on the patches to the southward and westward, but by keeping Muligi islands in sight, if proceeding north or south, the channel is clear.

Minna reef.—The Master of the German ship *Minna*, 1877, reports two coral reefs (Minna reefs) with 3 feet water on each, and 9 feet between; these reefs are 3 miles apart S.E. ½ E. and N.W. ½ W. from each other. The position of the N.W. reef is given in lat. 6° 58′ N., long. 117° 36′ E., and the S.E. reef lat. 6° 56′ N., long. 117° 38′ E. Also, that in lat. 6° 49′ N., long. 117° 52′ E., a reef (Schuck reef) with 3½ fathoms, and 6 to 7 fathoms around it, was found, extending one mile in an east and west direction.

The space included between the above dangers, Pudsey Dawson, Muligi, Minna, and Billean dangers has not been examined; it is reported to contain numerous reefs.

MALLAWALLÉ CHANNEL.—Dangers extend off 3 or 4 miles from the north-east coast of Borneo, and between these and Mallawallé is a channel 3 miles broad.

Egeria rocks.—These dangers, on one of which the British steam vessel *Royalist* is stated to have touched, are of a dark colo~~u~~r, and not easily seen; they have depths of 9 to 12 fathoms close around and between them.

The southern danger is a pinnacle rock, with 4 feet over it at low-water spring tides, lying with the islet north-west of Mallawallé island bearing N.E. by E., and South extreme of Mallawallé island E. by S. ¾ S.

The northern rock is about 20 yards square with 3 feet over it at low-water spring tides; it bears N.E. ½ N. from the southern danger, distant one cable.

The north extreme of Mallawallé island, and the south end of the northern off-lying islet just touching, leads about one cable south-eastward of Egeria rocks. The islet north-westward of Little Molleangan seen between Molleangan island and Little Molleangan (but nearerer Molleangan island), leads northward of Egeria rocks.

Coast.—The north-east coast of Borneo, between Silk island in Mallawallé channel, and Sandakan harbour, is generally low, densely wooded, intersected by numerous rivers and streams, and for a considerable distance from the shore the water is shallow and abounds with coral reefs.

As it would be impracticable from any mere written description to navigate with safety among the numerous dangers which lie eastward of Mallawallé island, it will be sufficient to describe the principal dangers, the appearance of the various islands and objects which present themselves as marks, and the routes usually adopted by mariners acquainted with the coast; for further information the charts must be referred to.

Lin-gi-san.—A chain of remarkable rocks 25 to 30 feet high, lying about N.N.E ½ E., distant 1¾ miles from the north-east point of Bankoka.

Passage reef.—At the distance of 2½ miles S.W. ¼ W. of the south point of Mallawallé island, and 1¾ miles N.E. by N. of Lin-gi-san rocks, lies Passage reef; it is awash at low-water spring tides, is easily distinguished, and may be passed in safety on either side. Another reef, awash at low water, on which is a small sand cay, lies 3 miles E. ~~½~~ S., of Passage reef.

Fly reef.—A reef on which H.M.S. *Fly* struck in 1880, on the west side of Mallawallé channel, is composed of coral, awash at low water, and about 1½ cables in extent; southward of this reef and separated from it by a channel less than a cable wide, is another coral reef about half a mile in extent, parts of which dry at low water. From the position of the *Fly* aground on the edge of the coral reef, the east end of Mallawallé island bore N.E ¾ N. northerly, and the west end N.N.W.

Clearing mark.—Banguey peak in line with west extreme of West island, Mallawallé island, bearing N.W. ¾ N. leads between Passage reef and the cay to the eastward of it; and Kubukan island on the north end of Tigabu island leads between Fly rock and the cay above mentioned.

Mandiralla, an island about half a mile in length east and west, is surrounded by a coral reef which, on the north and east sides, extends to a distance of about three-quarters of a mile.

It is densely wooded, the tops of the trees being 144 feet high.

Foul ground extends about 3½ miles E.S.E. of Mandiralla.

Bankoka hill is a conspicuous wooded hill, 587 feet high.

Tani-b~~o~~ungaan is a thickly-wooded island of considerable extent about 4½ miles south-east of Bankoka hill.

Bush island is a sand cay on which are a few bushes, the tops of which are about 10 feet high.

Foul ground.—Much foul ground exists between Mandiralla, the coast of Bankoka, Tani-boungaan, and Bush island.

Kukuban is a sand cay situated on the south-west part of a coral reef of about half a mile in diameter; it is covered with trees 70 feet high.

Rocks.—Southward of Kukuban are two dangerous rocks; the northern lies S.E. by S. $1\frac{1}{10}$ miles from Kukuban, with 6 feet water on it, and can generally be seen from the masthead. The southern rock, lying S. by E. $\frac{3}{4}$ E., distant 2 miles from Kukuban, has less than 6 feet water on it, and is very difficult to see. Much caution is therefore necessary when navigating in this neighbourhood.

Tigabu is an island about a mile in length, and densely wooded, the tops of the trees being 227 feet high. Reefs extend about 3 miles in a north-easterly direction from Tigabu island.

Between Tigabu and Kukuban are two reefs which are easily seen from the masthead, and Merlin rock, dark coloured and apparently nearly awash.

Tibakkan, situated about $2\frac{1}{2}$ miles north of the west point of Tigabu island, is a sand cay covered with trees 108 feet high. Dangers extend $1\frac{1}{2}$ miles in a north-easterly direction from this island.

Tamboulian, Bu-a-ning, and the adjacent reefs, form the south-eastern boundary of the Mallawallé eastern dangers.

Mosquito rock, about one cable in diameter, with a least depth on it of 3 feet, and steep-to around; lies with the following bearings Tibakkan island S.W. $\frac{1}{2}$ S., and Tamboulian (Marantabuan islet), W. by N. $\frac{1}{4}$ N.

NORTH-EAST COAST of BORNEO and OFF-LYING ISLANDS.—The coast between Bankoka hill and Jambongon or Simaddel island, 13 miles to the S.E., has not been surveyed. From Jambongon the coast trends about S.E. for 26 miles to Tanjong Siasib, and then turns south to Labuk bay. The off-lying islands and reefs, between which a vessel must pass on her way from Mallawallé channel, were surveyed in 1881 by H.M.S. *Flying Fish* to a distance of about 13 miles from the shore; beyond this distance there is an unexplored region extending northward to Pudsey Dawson dangers, and eastward to Muligi patches, within which numerous reefs have been reported.

N.E. and S.W. Bluffs are two prominent headlands on the west coast of Jambongon. The former is 442 feet high, and the latter somewhat less.

From the coast of Jambongon, reefs and dangers extend to a distance of about $5\frac{1}{2}$ miles. On these reefs are many sand cays, two of which, Mabahōk and Kalangaan, covered with trees, are especially conspicuous ; the former is 84 feet, and the latter 80 feet high.

Sipindung lies about 4½ miles E. by S. ½ S. of Tigabu ; it is a sand cay covered with bushes, the tops of which are about 20 feet high. Dangers extend south and south-west of this island, nearly three-quarters of a mile, and for about 2¾ miles in a N.N.E. direction the soundings are irregular, varying between 4 and 12 fathoms. On the north-west side dangers extend 1¼ miles.

Between the Sipindung dangers and the Tigabu reefs, there is a clear passage 1½ miles wide.

One and a half miles south-west of Sipindung is a small group of reefs, between which and the dangers south and south-west of Sipindung, is a clear passage three-quarters of a mile wide.

A shoal about 20 feet in extent, covered by 3 fathoms water, lies between the above small group of reefs and the reefs off Jambongon island.

Sandy island is a small sand cay which sometimes covers ; it lies about 4½ miles S.E. by E. of Sipindung.

Reefs.—Between Sandy island and Sipindung is a reef which is easily seen from the masthead. One and three-quarter miles S.W. of Sandy island is a patch of 4 fathoms, between which and Sandy island, there is a patch of 7 fathoms, and the soundings are somewhat irregular. Three-quarters of a mile south-east of Sandy island is another patch of 4 fathoms. A reef which has not been examined lies 7½ miles N.E. by N. ½ N. of Sandy island.

Leonan is a sand cay 5 miles S. ½ E. of Sandy island, which also sometimes covers. It is situated on, and about one mile from the north-east end of an extensive chain of reefs which lie in an E.N.E. and W.S.W. direction.

Reefs.—North-eastward of Leonan cay lie two reefs, the first distant 3 miles, and the second about 4 miles. Between the first of these and the reef on which Leonan is situated, is a clear channel nearly 2 miles wide.

Two miles N.W. of Leonan is a patch of 2 fathoms.

A rock, with less than 6 feet on it, and 4¼ to 7 fathoms to seaward, is situated eastward of the entrance to Paitan river, with Leonan bearing N. ¼ W., distant 6 miles, and Billean E. ⅝ S. A reef, dry at low water, lies 1½ miles S.E. by S. from this rock ; and three similar reefs trend south-westward for a distance of 2½ miles from the rock.

Billean, situated 12 miles south-eastward of Leonan cay, is a sand cay on which are a few bushes about 38 feet high. It is surrounded by coral reefs and dangers which extend in a north-easterly direction nearly 4 miles.

Billean North Dangers.—Eight miles north of Billean, and about the same distance east of Leonan cay, is an extensive group of coral reefs. A shoal, with apparently about 12 feet water, in lat. 6° 46′ N., long. 117° 47′ E. (approximate), was observed from the *Erzherzog Friedrich*. As these dangers have not been completely examined they should be carefully avoided.

Billean South Dangers is another dangerous group of coral reefs lying E.N.E. of Billean cay, distant 7 to 11 miles; they consist of the following, examined by H.M.S. *Rambler*, 1889:—

(i.) A shoal, with a depth of 2½ fathoms, and 9 to 22 fathoms around, is situated with Lankayan island bearing S. by E. Ely., distant 12½ miles, and Leonan W. ⅜ N.

(ii.) A shoal, with 3 fathoms, and 9 to 24 fathoms around, is situated with Lankayan island bearing S. by E., distant 9 miles, and Billean W. by S. ⅞ S. Shoals with depths of 6½, 3,* and 3¼ fathoms, and 13 to 24 fathoms around, lie respectively, N.W. ¾ W., distant 1½ miles; W.S.W., 1⅒ miles; and S.E. by E. ¾ E., 2½ miles, from this shoal.

Tagipil is a densely wooded and very conspicuous island situated 4¾ miles S.W. by S. of Billean cay; the tops of the trees are 184 feet high.

Bankuruan cays are two small sand cays covered with bushes. Billean, Tagipil, Bankuruan, and the mainland are almost connected by a chain of coral reefs.

Five miles S.E. by S. ½ S. of Billean is a large and conspicuous sand cay.

Lankayan is a sand cay covered with trees 100 feet high, and is surrounded by a coral reef. The soundings for about 4½ miles north-north-eastward are irregular, varying from 4 to 15 fathoms, one patch of 3 fathoms existing 3 miles N. by E. of the north point of the cay.

Shoal ground, with depths of 3½ to 4 fathoms, and 12 to 13 fathoms around, extends W.S.W. 2¼ miles from Lankayan.

A reef, dry at low water, and half a mile in extent, with a depth of 1¼ fathoms nearly half a mile to the northward of its northern end, and 8 to 14 fathoms around, is situated with Lankayan bearing E. ¾ N., distant 4½ miles from its southern end, and Billean N.W. ¾ N.

Two shoals, with depths of 1½ and 1¼ fathoms, 8 to 10 fathoms around, and bearing North and South distant half a mile from each other, lie south-westward of Lankayan. From the northern of these shoals Lankayan bears N.E. ½ N., distant 6½ miles, and Cay N.N.W.

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* This shoal is considered to be identical with that touched by the *Sunbeam* in 1887, in which case the depth cannot exceed 13 feet over some part of it. A shoal (Paknam shoal), with 3 fathoms or less water over it, is reported by Captain J. Gray, of the steamer *Paknam*, to be situated in lat. 6° 40½′ N., long. 117° 56¾′ E.

Kestrel shoal.—This shoal, situated 4 miles east of Lankayan, and over which H.M.S. *Kestrel* passed in the year 1879, is found to have 2 fathoms least water.

Bo-aan, the northern of a chain of islands which run in a N.N.E. direction from the mainland, is about one mile in length N.E. and S.W., 192 feet high, surrounded by a coral reef, and its lower parts are densely wooded.

Si-ba-ung is a small coral reef lying W. ¼ N., distant 4¾ miles from the north part of Bo-aan island. There are a few bushes 35 feet high on this reef.

Flying Fish rock lies 2½ miles east of Bo-aan island, and has 2¾ fathoms on it at low water.

Lihiman lies 2½ miles south of Bo-aan island, is about three-quarters of a mile in length N.E. and S.W., densely wooded, and 172 feet high. Both Lihiman and Bo-aan are mud volcanoes, which appear to have been active within the last few years. Half a mile N.E. of Lihiman is a small islet, with which it is connected by a coral reef.

Langaan is a small wooded island 120 feet high, situated on the south-west edge of an extensive coral reef. Within a radius of 3 miles, north and east of Langaan, the soundings are irregular, varying between 6 and 18 fathoms.

Caution.—Commander C. Johnstone, H.M.S. *Egeria*, reports having obtained a cast of 4 fathoms on a coral bank, "with Taganak island bearing S. 48° E., Bahala bluff S. 11° W., and Baguan island S. 74° E.; it was apparently of small extent, and might have had less water on it."

This shoal was not found by the *Flying Fish*, but the neighbourhood was but partially examined.

Great and Little Bakkungaan are two wooded islands 190 and 157 feet high; they are surrounded by numerous coral reefs.

Silingaan is a small wooded island 137 feet high. About one mile east of Silingaan is a reef on which is a sand cay, awash at high water.

Gulisaan lies about 1¼ miles S. by W. of Silingaan; on it is a clump of conspicuous trees 76 feet high.

Libarran is a low wooded island, 140 feet high, about 1½ miles in length, E.N.E. and W.S.W., with a small round islet close to the westward.

Clotilde rock, in lat. 6° 14′ N., long. 118° 22′ 15″ E., is a small coral reef, part of which is about 2 feet above high water; there is about 20 fathoms of water close to all round it.

Laurel rock, in lat. 6° 9′ 30″ N., long. 118° 29′ 0″ E., is 6 feet above high water.

Baguan is a densely wooded island 228 feet high. Off the north point of it, discoloured water was seen to extend a considerable distance to the northward. The passage between Baguan isle and Laurel rock is therefore not recommended.

Taganak.—This island is about one mile in length N.N.E. and S.S.W., and is surrounded by a coral reef; it is densely wooded, the tops of the trees being 554 feet high.

Taganak patches.—Irregular soundings, varying from 5 to 14 fathoms, were found to exist between 3 and 6 miles W. by N. of the north point of Taganak; this position is occasionally marked by tide ripples.

Gubbins rock is a dangerous patch of coral with about 6 feet water on it, lying 7 miles W. ¾ S. of the south point of Taganak island, and 11 miles N. by E. ¼ E. of Bahala North point.

LABUK BAY.—Labuk bay, situated about 20 miles north-westward of Sandakan, is about 19 miles wide between Tanjong Pandaras and Pulo Pura-pura, and about 16 miles in depth to Labuk river in the south-west corner of it. The north-west part of the bay is shallow, and blocked by numerous sand banks, which renders the navigation of that part dangerous even for boats; the south-eastern side is deeper, affording a passage to Labuk river. The western side of the bay is densely wooded, with numerous creeks; and the south-east side is fringed by islets and rocks extending some distance off shore.

From Tanjong Niogg, a well-defined point covered with trees, about 150 feet high, just southward of Pulo Pura-pura on the north-west side of the bay, the coast trends north for about 12 miles to Tanjong Siasib. It is wooded with casuarina trees, which in some places form peculiar clumps.

About 8 miles north-westward of Tanjong Niogg are Quoin and Flat hills, 650 and 630 feet high respectively.

Islets.—A chain of islets, of which Torongohok is the northern, lie in the south-western part of the bay. The northern portion of Torongohok is wooded with casuarina trees about 140 feet in height, forming a prominent object when approaching from the north-eastward.

Pulo Gusong is a small sandy islet about 2 feet in height on the eastern extremity of a sand-bank near the middle of the bay, and being devoid of trees is difficult to distinguish ; off Tanjong Pandaras are some low islets, merely clumps of mangroves on the fringing reef.

Pulo Tikus is a wooded pyramidical island, 234 feet high.

Labuk river.—The mouth of Labuk river is 20 miles south-westward of Tanjong Pandaras ; the entrance is 5½ cables wide, with a depth of 5 fathoms. The Bongaya river and several streams of no importance to trade enter the sea in the north-west portion of the bay.

Bar.—The best channel to Labuk river is between Libarran island and the low islets off Tanjong Pandaras ; the least water is on the bar between Gusong islet and Sungei Gum-gum on the south-eastern side of the bay, on which there is a depth of 9 feet at low-water springs.

Directions.—From the eastward, having passed Gubbins rock, course must be shaped to pass between Libarran and the low islands off Tanjong Pandaras, avoiding the rocks which lie off the reef extending about half a mile southward of Libarran island ; and when Round islet (westward of Libarran) is in line with Gulisaan, bearing N.E. by E., course must be altered to S.W. by W. These islets in line astern, lead clear and westward of the islets and rocks off Tanjong Pandaras, and the same course continued, allowing for tide, leads over the flats, in 9 feet at low water springs. When the water deepens course may be shaped to pass about half a mile westward of Semawang point, from whence to the mouth of Labuk river there is a depth of from 3½ to 5 fathoms.

Tides.—It is high water, full and change, in Labuk bay at 9h. 30m. during the period of the S.W. monsoon in the China sea ; springs rise 8 feet, neaps 5 feet. The maximum strength of the ebb observed in the river was 3 knots.

Supplies.—There is a village on Pulo Tetabuan and another on Pulo Linkabo, but no supplies were obtainable, nor was any fresh water met with.

COAST.—From Tanjong Pandaras the coast takes a S.E. by S. direction for 16 miles to Sandakan harbour, and thence it trends E.S.E. for about 60 miles to Tanjong Unsang, whence it gradually turns southward for about 11 miles to Dent haven. This coast is covered with thick jungle, principally casuarina trees from 150 to 180 feet high, fronting low, swampy land, with a narrow sandy beach.

Nunuyon Laut and Nunuyon Derat are two low wooded islands lying about 2 miles north-west of Bahala; they are almost connected with the mainland.

Bahala is an island about 2 miles in length, north and south, lying on the north side of the entrance to Sandakan harbour. The northern part of it is low, the southern rises in two conspicuous hills, 643 and 544 feet high; these hills slope gradually to the westward but their eastern faces are imposing precipices with two light red streaks running perpendicularly from the top to the bottom, by which the island may be recognized.

SANDAKAN HARBOUR.[*]—This magnificent harbour is 1¼ miles wide at the entrance, between Bahala island and the broad point opposite to the south east. From here it gradually increases in width, forming a spacious basin north of Pulo Bui, more than 3 miles in diameter, which constitutes the usual anchorage. The harbour continues south and west of Pulo Bui to a distance of 15 miles from the entrance, and large sailing vessels proceed as far as German Town on the island of Timbang, 11 miles up the bay, to load timber; but the only part surveyed is that north of Pulo Bui, and the bay of Sapa Gaya, situated on the south shore. From the entrance to the end of the bay the depth varies from 16 to 3 fathoms.

Some thirteen rivers run into the bay, and a bar has formed 6 miles from the entrance with a depth of water of 4 fathoms at low-water springs.

The eastern entrance of the harbour is formed by a large island, low and densely wooded, and separated from the main coast by a channel named Trusan Duyon; a shoal with from one to 3 fathoms water, extends north-east 7 miles from the shore. The cliffy hill on the eastern side of Bahala bearing S.W. leads 1¼ miles north of the shoal in not less than 4 fathoms over the flats in the approach to the harbour.

The northern shore is hilly: two of the hills are very conspicuous from seawards; one on Tanjong Papat, the point S.W. of Bahala being 674 feet high; the other, a three-peaked hill, is 844 feet high. Both of these hills, like Bahala, slope gradually on the western side, and are somewhat precipitous on the eastern.

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[*] *See* Admiralty Plan, Sandakan harbour, No. 950, scale, $m = 0{\cdot}8$ of an inch, and Sandakan anchorage, scale, $m = 1{\cdot}9$ inches.

Atjeh rock, the only danger, lies three cables S.E. of the end of the wooden pier at Elopura; it has 2¼ fathoms of water on it at low-water springs. It is marked by a buoy vertically striped red and white.

Elopura, the principal town and head-quarters of the North Borneo Company, is built on the north shore, three-quarters of a mile from the Tanjong Papat—the northern entrance point. The commercial town is on shore, but the Malay town is on piles over the water. From census taken in 1887 the population amounted to 3,312, of whom 31 were Europeans.

Frequent communication is kept up between Elopura and the other ports of North Borneo, and with Singapore by steamers of 300 to 400 tons burden.

Pier.—There is a substantial wooden pier alongside which steamers drawing 14 feet can lie whilst discharging and loading. It is 480 feet long, and 20 feet broad, with a T-head 150 feet long.

LIGHT.—Harbour lights, *red* and *green*, are exhibited on the pier at Elopura.

Anchorage.—The most convenient anchorage is about half a mile south of the town in 8 or 9 fathoms, mud.

Tides.—It is high water full and change in Sandakan harbour at noon. Springs rise 6¾ feet, neaps one to four feet.

Trade.—Most of the trade is carried on through Singapore with Great Britain and the Colonies. The exports comprise mostly jungle produce, wax, coco-nuts, gutta-percha, sago, tobacco, rattan, and indiarubber. The imports include cloth, hardware, manufactured goods of all kinds, rice, oil, sugar, and opium.

Supplies.—Beef and bread may be obtained here; fish is plentiful; coal, principally Labuan coal from the North Borneo Company. Water is abundant in the town, but there are no means of getting it off to the shipping.

Repairs.—There is a good flat beach of hard sand off the town on which small craft might be beached for repairs. There are Chinese carpenters displaying considerable skill.

Timber.—The supply of timber is ample, the uncleared land being covered with forest containing very fine trees.

DIRECTIONS.—Mallawallé channel to Sandakan.—The route most commonly adopted by vessels trading on this coast, is that through the Mallawallé Channel, thence south of Kukuban, Tigabu, and Sipindung, north of Leonan, passing midway between it and the small reefs north-eastward. From this position a course may be shaped to pass about 4½ or 5 miles north of Billean.

This route is probably the shortest ; the principal difficulties are the two isolated rocks south of Kukuban, and the narrowness of the channel S.W. of Sipindung. The dangers south of Kukuban may be avoided by adopting the route north of Kukuban and the reef lying E.S.E. of it, and then either proceed south of Tigabu and Sipindung as before, or through the channel between Tigabu and Tibakkan, north of Tigabu reefs ; thence north of Sipindung, east of Sandy island, passing through the channel between Leonan and the reef north-eastward of it ; or else, when half a mile south of Kukuban island, steering south for the hill on the north-west end of Simadal island, until the south end of Tigabu bears east, then shaping course for Sipindung. With due care but little difficulty will be found in navigating these channels.

Most of the dangers are easily seen from the masthead, except when the sun is right ahead, and the numerous islands and wooded cays afford excellent marks for bearings. It will generally be found advisable to take the channel next north of Leonan, as from this position Tagipil will be distinctly visible, and shortly afterwards Billean ; whereas by taking a more northern route, there is practically nothing to guide the navigator, and he will probably get foul of the North Billean Dangers.

Billean island should be passed at a distance of from 4½ or 5 miles, Lankayan also should be given a berth of about 5 miles. Having passed Lankayan no difficulty will be experienced in making Sandakan, by passing well northward of Bo-aan and Langaan islands, then between Taganak and the Taganak patches, all dangers will be avoided, and a straight course may be shaped for the mouth of the harbour.

Caution.—It should be borne in mind, that no reliance can be placed on the position of sand cays which have no vegetation on them ; the action of the sea frequently causes them to shift considerably and even disappear.

Tides.—At Sandakan, it is high water full and change, at 0h. 0m. Springs rise 6 feet 9 inches ; neaps vary from one foot to 4 feet.

At Tigabu, it is high water, full and change, at 11h. 38m. ; springs rise 6 feet 6 in. ; neaps vary between 0 feet 10 in. and 2 feet 6 in. ; at both places the tides during neaps are exceedingly irregular.

In the Mallawallé channel the flood was observed to run to the eastward and the ebb to the westward, and at springs had a velocity of about 2½ knots.

On the coast between Mallawallé and Sandakan, no regular tidal stream was perceptible, but when the N.E. monsoon blew steadily there appeared to be a constant set to the N.W.

COAST.*—Between Sandakan and Kinabatangan river, a distance of 30 miles, the coast is intersected by numerous streams, some of which are said to lead into the river and to be navigable for boats.

Landmarks.—About 11 miles eastward of Sandakan there is a conspicuous clump of trees 227 feet high, on the eastern point of entrance to Mamuyon river or creek ; and 6 miles farther eastward is the Abai clump 184 feet high, which from the eastward makes as an island ; it is not so easily distinguished from the westward. Kinabatangan hills 963 feet high, appear from the eastward as a long range with a slight summit ; from the westward, this summit shows as a cone-shaped hill. Aguja peak 638 feet high, from the westward appears as a double cone. Confusion hill, from the north-eastward shows a round top.

Notch hill, 803 feet high, is the most conspicuous of these hills having a sharp fall near the summit.

Mount Hatton, 1,990 feet high, is the most conspicuous mount on the coast, appearing as a sharp summit from all directions. The range extends in a W. by N. and E. by S. direction ; Ragged hill, 1,455 feet high, the western extreme, makes from the eastward as two cone-shaped hills. The eastern extreme of the range is a flat-topped hill 1,444 feet high.

Bagahak Mountain, 2,750 feet high is seen in clear weather beyond mount Hatton, and in the centre of a long sloping range.

Kinabatangan river.—The mouth of the Kinabatangan is 30 miles eastward of Sandakan. Driftwood point, the east point of entrance, is wooded, and may be distinguished at 15 miles from the coast making as a sharp and well-defined point.

From the entrance the river trends S.S.W. ½ W. for 5 miles to Dewhurst bay, which is 3 miles long, and one mile broad, having depths of from one to 2 fathoms. The main branch turns westward at 5 miles from the entrance, from whence it was examined for a distance of 6 miles ; depths of from 4 to 5 fathoms were found, and the river at this distance was 300 yards wide, with a depth of

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* *See* Admiralty chart, Sulu Archipelago and North East coast of Borneo, No. 2,576 ; scale, $m = 0{\cdot}1$ of an inch.

6 fathoms. No villages were seen, and but few boats; no fresh water was obtainable.

Bar.—The river between the entrance points is 6 cables broad, with depths of from 4 to 5 fathoms; the bar, which extends 2½ miles seaward, has a depth of 12 feet at high water springs. Vessels drawing more than 8 feet should not attempt to cross the bar without a boat ahead, as the tides are much influenced by the winds rendering the time of high water uncertain.

Nymphe reef lies 6 miles N. 23° E. from Driftwood point, Kinabatangan river. This coral reef $1\frac{8}{10}$ miles long, with a breadth of 7 cables, has a depth of one foot at low water springs, with from 17 to 20 fathoms within 4 cables of it. Patches of 5¾ and 7 fathoms were found on its south-west side at half a mile and one mile distant respectively. Being within the limit of discoloured water from Kinabatangan river, Nymphe reef is seldom seen, but is marked by a slight ripple. It breaks occasionally in heavy weather.

Clearing marks.—Abai clump, bearing W. by N. ¼ N. leads southward of Nymphe reef, and the mouth of Kinabatangan river bearing S.W., leads eastward of it.

Pegasus reef is situated 10 miles N. 76° E. from Nymphe reef, and 14 miles from the coast.—This reef, nearly 2 miles long, north and south, by 1½ miles broad, with a least depth of 3 feet, is composed of live coral with patches of sand; depths of from 26 to 30 fathoms were obtained at the distance of one mile from the shoal heads; the discoloured water was easily seen from the masthead.

The centre of the reef lies in lat. 5° 46¼′ N. long. 118° 50′ E.*

Segamah river.—The mouth of the Segamah river is 14 miles eastward of the Kinabatangan; between the entrance points it is 5½ cables wide, with a depth of 2½ fathoms. From the entrance the river trends S. ½ E. for about 3 miles, with two islands in it; thence it splits up into numerous creeks, three of which were examined for a distance of 2 miles, and were found to be from 40 to 60 yards wide, with depths of from 2 to 3 fathoms.

Bar.—The shallow water fronting the river extends about 2½ miles from the coast; the least depth over which, leading to the river is 9 feet at high water springs. The same caution is necessary as for the Kinabatangan.

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* The shoal reported by H.M.S. *Fly*, and published in Notice to Mariners, No. 200 of 1883, as being situated 11 miles N.W. by W. ½ W. from Peri bank; also Peri bank, reported to lie in lat. 5° 47′ N. long. 118° 56½′ E. are considered to be identical with Pegasus reef, and are therefore removed from the charts.

Marowop river.—The mouth of this river, 8½ miles eastward of the Segamah, is 7 cables wide, with depths of from 3 to 5 fathoms between the entrance points.

Bar.—There is a depth of 14 feet on the bar at high water spring tides, but caution is necessary in crossing, as the sea breaks on it with S.E. winds.

From the entrance, the river trends S. ¾ E., a distance of 3 miles, to Evans island, where it divides into numerous branches.

Tangusu bay is a shallow bight to the south-westward of Tambisan islands.

Rock.—A rock with 4 feet at low water springs, lies nearly one mile off the shore reef with Tambisan peak N.E. by E. distant 2 miles.

Tambisan island, about 3 miles in length, east and west, by 1½ miles in breadth, is about 220 feet high, and covered with trees. The west point is high and easily distinguished from seaward, but the east point is low; the island is fronted by an extensive coral reef. A narrow channel separates the island from the mainland, but is only navigable by boats, being blocked by a reef which extends nearly across the channel, 1⅓ miles from the western end.

René shoal, composed of coral and sand, is 5 miles long in a north-west and south-east direction, and 2 miles broad within the depth of 20 fathoms. From the shallowest spot of 3 fathoms, the peak of Tambisan island bears S.W., distant 4½ miles.*

Gem reef (originally reported by the brig *Gem*) is situated 3 miles northward of René shoal. It is a coral patch, 3⅓ miles in length, and nearly 2 miles in breadth, with a depth of 3 feet only on some of the heads; deep water is found a short distance from the rocks. From the shoal heads Tambisan peak bears S. by W. about 8½ miles.†

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* René shoal and Modeste shoal, which have been reported to be situated in lat. 5° 30′ N., long. 119° 11′ E., are identical.

† The shoal reported by H.M.S. *Swinger* in 1878 as being situated in lat. 5° 34′ N., long. 119° 10′ E., is considered to be identical with Gem reef. Discoloured water was reported by the *Erzherzog Freidrich* in lat. 5° 37′ N., long. 119° 15′ E., published in Hydrographic Notice No 9 of 1878; no bottom was obtained in this position at 20 fathoms. A sounding of 140 fathoms was obtained three-quarters of a mile N.W., and 67 fathoms at 2 miles N.N.E. of it.

Magpie bank.—This extensive bank lies 8 miles north-north-westward of Gem reef; within the 20-fathom line, it is 7 miles long in a north-west and south-east direction, and 2½ miles broad. With the exception of the western side of the bank, the water deepens suddenly to no bottom at 100 fathoms. The centre of the bank, with 10 fathoms, lies N. ¼ W., distant 17½ miles from Tambisan peak; an isolated patch of 9 fathoms, the least water found on the bank, lies 1½ miles south-westward of this position.

Sunday bank lies N. ½ E., distant 23 miles from Tambisan island, and N.E. by E. 6 miles from Magpie bank. The shoalest water on this bank (10 fathoms, sand and coral) is in lat. 5° 50′ 35″ N., long. 119° 09′ 30″ E.; and the 20-fathom limit is about 2 miles in an east and west, and 1¾ in a north and south direction; from this shoal the land about Hog point is visible.

Coast.—From Tambisan island the coast trends E.S.E. for 3½ miles to Tanjong Unsang, where it turns gradually to the southward for 10 miles to Dent haven. It is densely wooded, and fronted by a narrow fringe of coral, which is steep-to.

Dent haven is nearly 2 miles broad between Reef and Mangrove points, and affords good anchorage in the south-west monsoon, in about 5 fathoms, sand and mud; but a slight swell sometimes sets into the bay. The southern part of the bay, near the Mangrove islands, is foul. Three brackish streams run into Dent haven; the two northern are dry across their entrances at low water. In the southern stream, boats can find good shelter inside the spit, in deep water, the entrance being through a narrow channel in the reef. The whole coast line was found to be but the barrier of a great swamp, filled with trees, but mostly dead or blasted.*

Banks.—Reef point, the northern point of the haven, is foul for two-thirds of a cable from the shore, and a sand-bank awash at low water lies N.E. ¾ E., distant 3 cables from the point.

A bank, situated 1½ miles off Reef point, extends 1½ miles in a north and south direction, and is one-quarter of a mile wide. Near its northern extremity is Hull rock, which breaks in south-west winds, with a depth of 4 feet at-low water spring tides; Reef point bears W.S.W., distant 1½ miles from the rock.

Directions.—Coming from the northward, to avoid Hull rock and bank, the extreme point southward of Dent haven should not be brought to the southward of S.W. by S. until the southern end of the long sandy beach in the bay bears W. by S., when it may be steered for, anchoring as convenient.

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* Voyage of H.M.S. *Samarang*.

Supplies.—There is no village in Dent haven, but natives occasionally visit the place. Fish may be obtained with the sein near the beach southward of the southern stream. Bathing is dangerous on account of alligators.

Tides.—It is high water, full and change, at Dent haven during the period of the south-west monsoon at 6h. 34m., and at Tambisan island at 10h. 52m.; springs rise 3½ feet. At Kinabatangan river at 11h. 17m.; springs rise 5½ feet, neaps 4 feet. Between Sandakan and Tambisan the flood stream sets to the north-westward and the ebb to the south-eastward; the tidal stream is slight, rarely as much as one knot.

At the distance of 10 miles from the coast, during the south-west monsoon, the regular south-east current, from one to 2 knots an hour, makes itself felt, and the north-westerly (flood) set is not experienced, only a slackening of the current during flood tide.

Between Tambisan and Dent haven the tidal streams are more strongly marked; the flood sets to the northward and the ebb to the southward at the rate of from 2 to 3 knots per hour.

Tide rips.—From Gem reef to Sibutu passage frequent and sharply-defined tide rips occur, which have the appearance of shoal water.

SIBUTU ISLAND, the north end of which is in lat. 4° 54′ 40″ N. long. 119° 27′ E., lies W. by S. ¾ S., about 18 miles distant from the Observation islet south of Bongao; it runs nearly north and south and is about 14 miles long, with an average breadth of 2 miles.

With the exception of the single peak on the east coast, which has an altitude of 524 feet and is a perfect cone, the island is flat and densely wooded.

A reef fringes the coast, and then runs nearly 8 miles south of its southern point, when it trends to the westward; this reef is dry at low water, and has numerous boulders, sand cays, and blocks of coral on it, while there are some small islets covered with trees near its south-west extreme. This reef is steep-to all round, and there is no anchorage; but a ship might stop a tide by dropping her anchor in 15 fathoms due north of the island, when she would swing round within three-quarters of a cable of the fringe reef.

Tides.—It is high water, full and change, at 6h. 50m.; springs rise 5 feet. The flood and ebb streams run for 3 hours after high and low water.

Omapui and Tumindao.—From 2 to 2½ miles west of Sibutu a chain of islets and reefs runs to the southward and parallel to it, leaving a deep channel between Sibutu and these islands ; but as the southern part of this channel with the islets and reef have not been examined, no one should venture to use it, especially as the passage between Simonor and Sibutu is 18 miles wide, leaving plenty of working room, and apparently free from danger.

From the north-east point of Omapui the reef trends to the north-west for about 2¼ miles, and then to the south-west.

There are no permanent inhabitants resident on any of these islands, but they are much frequented by fishermen from Simonor and Borneo, for the beche-de-mer, which are found in great profusion on the reefs to the westward.

The natives report that wild cattle are very numerous in Sibutu, and they often hunt them. Omapui abounds with wild pigs.

Of the numerous islands and shoals between these islands and Darvel bay, there is no information beyond what is given on the charts.

DARVEL BAY lies on the south side of Tanjong Unsang peninsula. The north shore of the bay appears safe, but the west and south sides contain numerous coral reefs, which may generally be seen from a ship's deck with the sun in a favourable position.

Coast.—From Tanjong Labian to Tolibas the land is low and thickly wooded, but to the westward of Tolibas undulating hills commence, and rise to the Bagahak range, the lower hills of which run down to the sea some 7 miles west of Tunku. The line of coast trends uniformly W.S.W. without any great indentation, and the *Egeria* obtained soundings of 13 and 14 fathoms at 1½ to 2 miles from the shore between Tanjong Labian and Sibat river.

Sibat is a small stream the mouth of which is marked by nipa palms ; the village is some distance up the river.

Tolibas is a small village on either side of a small stream of the same name, only accessible to boats. The anchorage off it has good holding ground and an even bottom. The *Egeria* anchored here in 8 fathoms at a distance of 1½ miles from the shore, the bottom consisting of mud, and coarse coral sand.

Tunku river is shallow, and discharges itself about 6 miles to the westward of Tolibas. Near its mouth, a shoal bank runs off shore deepening suddenly from 10 fathoms to no bottom at 20 fathoms. The *Egeria* anchored in 10 fathoms about 2 cables distance from the bar. From the point E.S.E. of the river a reef extends half a mile to the southward.

Reef.—A coral reef about 2 cables in extent with 3¾ fathoms over it, was found in lat. 4° 56′ 30″ N., long. 118° 51′ 0″ E., from which the centre of Gaya island bore S. 17° W.

Darvel peninsula is a long low point, covered with trees, about 40 to 50 feet high, their tops being nearly level ; at a distance it has the appearance of a long, flat-topped cliff. The chart shows a sounding of 3 fathoms at a distance of 3 miles W. by S. of Shoal point, the south-western extreme of the peninsula. [illegible] 1680

Sakar island has two islands off the south extremity ; it is high, and can be seen over Darvel peninsula.

Lahat Datu.—We have no information about this settlement, the vicinity of which has not been surveyed, but the following directions are given by Captain Gray of the coast-steamer *Paknam* :—

Directions for entering Lahat Datu harbour.—From a position 3 miles south of Shoal point, steer west until the N.E. end of Sakar island bears N.W. by W., then steer for it on that bearing until the easternmost island of a group in the south part of Darvel bay (? Tabuan) is in line with the last gap on the hills on Tanabalu and a peak at the back on the bearing S.S.E. ½ E. ; then steer N.N.W. ½ W, which will lead clear of a reef projecting from the N.E. end of Sakar. though close to it. This reef which can always be seen with a good look out, should be rounded at the distance of 50 yards ; then, a course W. by N. ¾ W. with the north point of entrance of a river astern, leads clear of reefs to the northward and southward which are easily seen. After passing the northern outer reef, haul up for the houses and anchor in 5 fathoms ; the reefs are steep-to, and were marked by beacons (3 stakes), but these often get pulled down.

Bai island shows as a high peaked island, sloping more gradually to the northward than to the southward.

Leila rock, lying S.E. by E. of Bai island, is a coral patch about a quarter of a mile in extent, with 2 feet least water near its southern extremity ; its position is indicated by the ripples over it.

Clearing mark.—Mark hill kept open of Bai island clears the Leila rock.

Bati island is a small round island, covered with trees ; it is steep-to on its northern side, but a spit projects from its eastern and western ends, and a reef extends from it to Saddle island.

Saddle island is about one mile long N.N.W. and S.S.E., and about 300 feet high.

Silam anchorage, under Mount Silam, is nearly land-locked by six islands, and the anchorage is at the head of the harbour off the settlement between two reefs which partially dry, but have a narrow passage between them. The reefs are marked by beacons of nipa palm : those on the eastern side are painted red, those on the western side white. A gun-boat can anchor between the four beacons in 8 to 10 fathoms ; a large ship should anchor further out. The *Egeria* anchored about 1¼ miles off the settlement in 11 fathoms.

Silam.—The North Borneo Company have a small settlemen here ; an experimental garden has been planted about half a mile from the beach, in which Liberian coffee seems to grow well ; also cardamoms and pepper. Timber is plentiful and good ; cattle thrive well.*

Directions.—To enter Silam anchorage, when Pulo Bati is made out, steer for it on a W. ¾ N. bearing ; when the houses of the settlement come in sight steer for them on a N.W. by W. ½ W. course, passing between Bati island and Bai island.

Divatu river is only a small stream, and too shallow to allow a ship's gig to enter. The anchorage is about 2½ miles off shore, with the northern of two small islands bearing W. by N. ½ N. in 17 fathoms, mud. Ships should not go in closer as there are many coral patches with deep water between them.

Three reefs were found by H.M.S. *Moorhen* in the western part of Darvel bay, 2 miles E. by S. ½ S. of the mouth of Divatu river. These reefs which break at low water lie in an E.N.E. and W.S.W. direction, and are about a quarter of a mile apart.

Directions.—Vessels visiting Divatu, should bring Saddle island to bear North, and then steer for the northern of the two small islands on a W. by N. ½ N. bearing. Care should be taken to have the sun in the right position for seeing the reefs, which abound in this part of Darvel bay.

Tana Balu or Timbu Mata island in the southern part of Darvel bay, is about 15 miles long, east and west, and 3 miles wide ; it is separated from the main land by a sound carrying deep water for about 5 miles up from its southern end, but very shallow water in its western part beyond Pyramid hill. The island is mountainous, rising from a low western point, and having on its eastern extremity a conical hill 1,700 feet high, named Gunong Kuli

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* Tides.—It is high water, full and change, at Silam anchorage at 6h., springs rise 6¾ feet, neaps 5¾ feet.

Babang.* Tana Balu and Gaya islands form the two most conspicuous objects on the coast. A reef extends about half a mile in a north-westerly direction from Bluff point, the eastern extremity of the island.

Grassy point, forming the south point of Timbu Mata island, is formed by the spur of a hill running down to the water in a north and south direction. Near the water's edge it is fringed with trees, and there are a few on the upper part of the ridge, which otherwise is covered with grass ; it is easy to distinguish, being the only comparatively cleared ridge in the neighbourhood. The *Satellite* in 1886 anchored in 10 fathoms, with Grassy point bearing W. ½ W.

The *Egeria* passed the channel between Timbu Mata and Daliang islands on its northern side, and found 4½ fathoms depth in mid-channel at the narrowest part, which is about a quarter of a mile across.

Gaya island, composed of three islands, shows as a long hill, the two outside islands of which have remarkable conical peaks, and the outline of the centre island is also striking. From the north part of Sibuko bay, Gaya island and Timbu Mata island, both of which are thickly wooded, show over the low Islands to the southward of them. Gaya island is surrounded by reefs, through which there are many passages. To approach the village on its south side, a passage in will be found round the west point, nothing less than 3 fathoms being found in it by the boat of the *Egeria.*

Reefs.—The reefs west and south-west of Gaya island were seen by H.M.S. *Egeria* when passing, but have not been surveyed. A reef extends for about half a cable west of Low island, which lies about 3 miles S.W. by W. from Gaya, to Sibuan island which lies N. ½ W. about 4 miles from Low island. These two last named islands are both well wooded.

Kuli-Babang island, Bum Bum. and Omadal are low, flat, and wooded islands ; there is supposed to be a channel between Kuli-Babang and Bum Bum ; but it has not yet been discovered.

Treacher channel, between Kuli-Babang and the main land of Borneo, is said to be the best route for vessels proceeding to Sibuko river. The settlement of Simporna is within the channel on the west side ; the tides run strong off the wharf of the settlement.

Directions for Treacher channel.—After passing the island S.E. of Grassy point, the entrance will be easily distinguished by a small hill, the easternmost of all those on the main land, lying right over it: there are no hills on Kuli-Babang. From a position with the eastern extremity of Tana Balu over the centre of S.E. island, and Gaya island and Low island touching, the opening in the reefs which extend off both sides of the entrance will be easily distinguished. Steer a mid-channel course, passing to the westward of Daisy islets which are joined to Kuli-Babang by reefs—the reefs on either side are plainly visible.*

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* This must not be confounded with Kuli Babang island, about 8 miles to the S.E.

Egeria passage.—To the northward of Omadal is an extensive reef, impassable for a large boat; between this reef and the island is a deep channel, continuing between Omadal and Bum Bum islands, and for about 3 miles to the westward, turning to the southward for 3 miles between two reefs, the passage varying in width from 150 to 400 yards. No native name being known for this channel, it was called after H.M.S. *Egeria*.

Anchorage.—The *Satellite* in 1886 anchored in this channel about 1½ cables from the village of Omadal, and found it an excellent anchorage, well protected by sand banks at either end of the channel; and the *Egeria* in 1880 anchored off the village of Kobang in 5 fathoms, with the S.E. point of Bum Bum island bearing N. 58° E. and Si Amil island S. 62° E.

Bum Bum islands are three thickly wooded islands situated on Bum Bum reef, near its western edge; these islands extend 2½ miles in a north-east and south-west direction; Sipangan the south-westernmost, and Timbu-Mata the north-easternmost, have each one summit 340 feet high; Bum Bum, the central and largest has two summits about 358 feet high.

Another small island, thickly wooded, and also named Sipangan, lies 5 miles E.N.E. from Timbu-Mata.

Bum Bum haven, about 5 miles long in a north-east and south-west direction, and one mile broad, with 9 to 12 fathoms, mud bottom, is protected from seaward by Bum Bum islands and reef, which form the south-east side of the haven. The entrance to Bum Bum haven is one mile wide, but the navigable channel is contracted to half a mile by the reefs extending from Hornat point (north-west entrance point), which is thickly wooded and of a dark green colour. About 2 miles within the entrance, the haven is narrowed to 6 cables by a small reef with deep water close around, abreast Timbu-Mata.

Ligitan islands.—Of this group, lying off the north coast of Sibuko bay there is very little information, but they appear to be surrounded by dangers. Si Amil, the north-easternmost, appears by the chart to be wedge-shaped, and 800 feet high ; Danawan, to the westward of it, appears to be low.

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* Lieutenant Jones, H.M.S. *Zephyr*, 1886.

A small islet with a few shrubs on it lies in latitude 4° 12½′ N., longitude 118° 54′ E. From it, Si Amil island bears N. 5° W. Reefs extend 4 or 5 miles from this islet in an easterly direction,* and it appears to be connected by a reef to Si Amil ; this reef is dangerous, as there are no symptoms except breakers about one mile eastward of the islet.

Sipadan, the southernmost of the group, is 120 feet high. Coming from the eastward Sipadan should be kept to the northward of west, as the extent of the reefs to the eastward of it has not been determined ; they do not appear to advance to the southward of the island.

Mabul island, to the northward, is also 120 feet high, and well wooded.

SIBUKO or ST. LUCIA BAY, situated about 70 miles south-west of Tanjong Unsang the north-eastern extreme of Borneo, has on its north side several mountain ranges, the spurs of which extend to the shores of the bay and to the neighbouring coast ; the mountains and valleys are covered with extensive forests.

From mount Andrassy, 2,600 feet high, situated about 7 or 8 miles north-westward of Sibuko bay, a ridge extends 11 miles in an easterly direction to mount Wüllerstorf, 1,720 feet high, between which and Pöck range at 7 miles to the eastward flows a little river. From the highest mountain (1,600 feet) of the Pöck range a spur extends 3 miles to the southward, and terminates over point Delconte, in two peaks each 1,000 feet high, and 1½ miles apart east and west.

Erzherzog Friedrich reefs, situated about 4 miles from the shore on the north-east side of Sibuko bay, are steep-to ; the westernmost and smallest reef, three-quarters of a mile in extent, dries 7 feet at low water ; the middle reef, 1½ miles in extent, dries 8 feet at low water, and is separated from the westernmost by a channel 1¾ miles wide, having near the centre a depth of 12 fathoms ; the easternmost and largest reef, portions of which dry at low water, is separated from the middle reef by a narrow impracticable channel.

Caution.—Care is necessary when approaching Erzherzog Friedrich reefs from the eastward, as the extent of the largest reef is not known.

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* In the chart it is shown to extend to the south-east.

Friedrich haven.—The channel between Erzherzog Friedrich reefs and the north-east shore of Sibuko bay forming Friedrich haven, is 18 miles long E.N.E. and W.S.W., and one to 4 miles wide, with depths of 3 to 14 fathoms, mud; in the west entrance of the haven, lie the three Lehnert reefs, which dry 2 feet at low water; the southern reef, 2½ miles from the shore, bears W.N.W., 5 miles from the westernmost Erzherzog Friedrich reef, the northern reefs are 2 miles apart and lie close to the shore.

A shoal,* about 200 yards in extent, having generally about 2¼ fathoms over it, but with two shoal heads of only one fathom at low water, 50 yards apart and near its centre, was found by the *Egeria*. From it the following bearings were taken:—Batu Tinagat point S. 86° W., Saddle hill N. 37° W., and Silungan island N. 62° E.

At the entrance of the little river, which empties itself into the western part of Friedrich haven, lies Kiraz island, 100 feet high; thence to abreast Silungan island (100 feet high and thickly wooded), 6 miles in an easterly direction, a shoal having 12 feet water near its outer edge and 4 to 13 fathoms close to, extends nearly 2½ miles from the shore, narrowing the haven in that part to about one mile.

The east entrance to Friedrich haven, between Erzherzog Friedrich reefs and the Ligitan islands, was not examined by the *Erzherzog Friedrich*. H.M.S *Samarang*, 1845, Captain Sir E. Belcher, however, ran in between these reefs and the islands, anchoring in 10 fathoms within a convenient distance from the shore.

Sandy island, small, and thickly wooded, situated in the east entrance of Friedrich haven, 5 miles east from Silungan island, stands on the north-west part of a shoal about a mile in extent; a portion of this shoal dries at low water in a south-easterly direction from Sandy island.

Anchorage.—The *Erzherzog Friedrich* entered the haven between the two westernmost Erzherzog Friedrich reefs, and anchored in 5 fathoms, mud, 1½ miles north of the western reef.

Tides.—It is high water, full and change, in Friedrich haven at 6h. 30m.; springs rise 12 feet. The streams run one to 2 knots an hour.

Batu Tinagat point is the north entrance point of a channel 20 miles long and 4 to 5 miles wide, formed by the island Sebatik with the main land; at the head it communicates by a narrow channel with Sibuko river.

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* The position of this shoal agrees with that of the southern Lehnert reef found by the *Erzherzog Friedrich*. The chart prior to 1888 showed a patch of one fathom lying 4 miles S. ¾ W. of the above reef, but this patch has now been expunged.

From the point the 5-fathom line extends in a south-easterly direction for about 7 miles, and to the northward of this line the water shoals gradually to the shore.

Batu Tinagat is a small mushroom-shaped rock rising from the sea off the point; it is about 15 feet high, and has a few bushes on it. From this rock the shore trends back a little to the northward of west, and at about 5 miles from the point is the entrance of the little river Tawao, on the left bank of which the Dutch have a small settlement.

Leading mark.—By steering in with a cone-shaped hill named Kukusan, about 630 feet high, bearing N. 42° W., 9 to 12 fathoms of water may be carried up to the anchorage.

Sebatik island.—The only information we have of this locality is from the Dutch chart, on which shoal water and detached patches are shown to extend to 6 miles from the east point of the island. The southern point of the island forms the northern entrance point of Sibuko river.

Sibuko river appears to be large and important; the entrance is divided into arms by the island East Nonokong; on the bar at the mouth of the southern entrance a least depth of 4½ fathoms is shown on the chart. A shoal spit with 3 fathoms at the end is shewn to extend 7 miles to the eastward of Nonokong island.

Detached shoals.—Unarang shoal has a least depth of 7 feet on it, and lies with the following bearings: south point of Sebatik N. 86° W., mount Kukusan N. 40° W.

Padang, a small sand bank covered by 7½ feet water, lies with the south point of Sebatik island N. 89° W., and the east point N. 9° W.

Banda reef is a coral reef with 6 feet of water over it, in lat. 3° 49′ N., long. 118° 0′ E.

Mangkassar is shown as a rock that breaks, lying 6½ miles E. by S. ¼ S. of the south point of Sebatik.

The chart shows a patch of 3 fathoms with no soundings round it in lat. 3° 51′ N., long. 118° 11′ E.

SIBUTU PASSAGE, to which allusion has been made (p.183), separates the Borneo islands from the Sulu archipelago. It is a safe and deep channel 18 miles wide between Sibutu and Simonor islands, the shore on either side being steep-to.

In navigating this passage, great attention must be paid to the tides which run with a velocity of 2 to 4 knots. The times of high water at Sibutu island, Dent Haven, Port Bongao, Pearl bank, Dok Kan, and Kagayan Sulu are from 6h. to 6h. 40m., and the stream runs for 3 hours after high and low water ; but it must be borne in mind that the times of high water at Tambisan, and on the Borneo coast are from 11h. to 12h., and that the streams are weaker than in the offing.

The officers of the *Nassau* remarked during the survey in 1872 that the tides in the main channel were very steady in direction—flood stream setting to N.W. and ebb to South ; but there was uncertainty as to duration, the streams occasionally running as much as 10 hours at a time—probably influenced by the winds and also by changes in the moon's declination, as with the tides on the south coast of Mindanao, *see* Chap. I.

CHAPTER V.

VERDE ISLAND PASSAGE TO ILOILO.

SOUTH-WEST COAST OF LUZON TO SIGAYAN POINT—NORTH AND EAST COASTS OF MINDORO—TABLAS AND ADJACENT ISLANDS—WEST COAST OF PANAY.

Variation 1° 00′ East in 1890.

VERDE ISLAND PASSAGE.—Verde Island Passage is the name given to the strait that separates the south-west part of Luzon from the north coast of Mindoro. It is constantly used by vessels trading between Manila and Iloilo, Sebu, and other ports in the Philippines, and is the western entrance of the route through San Bernardino strait, formerly used by the galleons, to Acapulco in America.

Verde island divides the strait into two passages, either of which may be taken, but that north of Verde island is preferable as the southern one is interfered with by the Bakos islets. The tidal streams in the channel are very strong, reaching 3 to 4 knots at springs; the flood stream sets to the eastward, and the ebb to the westward. There are no records of the tidal hours, but they are reported to be the same as at Manila.

In this chapter it is proposed to describe the route through Verde island passage, down the east coast of Mindoro, and the west coast of Panay, to Iloilo.* The description being taken from the Spanish Derrotero of 1879.

SOUTH-WEST COAST of LUZON.—**Cape Santiago** is moderately high, wooded, and surrounded by a reef which extends about a cable from the shore, and dries. The soundings at the edge of the reef are 4 to 5 fathoms, deepening abruptly to 44 and 55 fathoms at the distance of half a mile.

LIGHT.—There is a semaphore station on cape Santiago, in connection with Manila, and a lighthouse will shortly be commenced.

Minerva rock, on which the *Minerva*, of Alloa, is reported to have struck at 2 a.m., September 10th, 1834, is said to be a coral rock, having 17 fathoms water near it, and bearing from cape Santiago S.E. ½ E., distant 4 or 5 miles. The rock was searched for unsuccessfully by the Spanish Hydrographic Commission under Captain D. Claudio Montero, and has been erased from the Spanish charts.

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* *See* Admiralty chart, between St. Bernardino and Mindoro straits, No. 2577; scale, $m = 0{\cdot}1$ of an inch.

Pagapas bay, between cape Santiago and point San Pedriño to the northward, is very deep ; the shore is fringed by a narrow reef with soundings of 7 fathoms near its edge. Anchorage may be found on the eastern side of the bay in 7 fathoms ; the western part is rocky. At the bottom of the bay is the little port Kalaboso, formed by a break in the reef ; the entrance is difficult, and it is only frequented by coasters.

Point San Pedriño is surmounted by a hillock ; it is well wooded, and is encircled by a reef that extends to a cable's distance from the shore.

BALAYAN BAY, the great bay between cape Santiago and point Benagalet or Kalumpan, is clear of danger, with bottom of sand and mud, but the shores are so steep that a vessel must approach very close to get within 12 fathoms depth.

Winds and Tides.—The winds in this bay follow the monsoons generally ; the land breeze blows nearly every evening. The flood stream makes to the southward, and the ebb to the northward.

Balayan town, at the mouth of the river of the same name, is situated 6 miles to the northward of point San Pedriño ; there is anchorage to the eastward of the river in 3 to 6 fathoms, sand and rock, sheltered from all winds but those from the southward ; only boats of light draught can enter the river, as the bar has only 3 feet of water over it at high water. Mount Balayan, which lies 3 miles N.E. of the town, serves as a guide to the anchorage. The town consists of 25,000 inhabitants, and affords supplies of all kinds.

Taal lies 11 miles E.S.E. of Balayan ; the coast between these two towns is low and sandy, but steep-to. This important town, of 42,000 inhabitants, is at the entrance of the river Pansipit, into which vessels of 100 tons burden can enter. The best anchorage is to the north of the mouth of the river near the shore in 7 fathoms, sand, with the fort of Taal in line with Mount Makalog ; it is sheltered from all winds from north to south through east. There are 7 feet of water at high water on the bar of the river which flows from the lake of Taal and enters the bay about a mile from the town. The inhabitants of Taal, like those of Balayan, are engaged chiefly in agriculture, care of cattle, and in fishing ; provisions are plentiful, and there is active commerce with the province of Manila,

Point Benagalet, the western point of Kalumpan peninsula, is a rocky bluff fringed by a narrow reef, which runs all round the south-west of the peninsula to near point Cazador. This part of the coast is clean, with soundings of 25 fathoms close to; it is of regular height and covered with wood.

Point Cazador is the southern end of Kalumpan peninsula, which separates the bays of Balayan and Batangas. It is formed by a tongue of land of regular height, covered with trees; off the point, and joined to it, are some rocks, and on its eastern side a narrow reef, with soundings of 3 to 11 fathoms at half a cable distance, which soundings deepen abruptly to 65 fathoms at 2 cables from the southern part.

BATANGAS BAY, contained between point Cazador and point Matoko, 9 miles to the E.S.E., penetrates 9 miles to the northward; it is clear and deep, with steep coasts. From point Cazador the coast for 6 miles to the N.N.E. is steep, rocky, and wooded; it can be passed without danger at a distance of a third of a mile. From thence the coast is low, with sand beaches cut into by the little rivers Balito, Buang, Batangas and Kalumpan.

Batangas river, which enters to the eastward and very near to the town of the same name, is so shallow that a canoe can hardly enter it at low water, and even at high water boats have a difficulty in going up it. There is a watering place up the river at a little distance from the mouth, and further up the river divides into two branches; one branch is directed to the eastward, and with some windings passes close to the town of Batangas, of 35,000 inhabitants at three-quarters of a mile from the mouth; the other branch is to the south-east, and joins the river Kalumpan. To the west of the mouth there is a sand-bank, which is mostly uncovered at low water.

Kalumpan river enters three-quarters of a mile from the Batangas river. The bank which forms its bar is 2 cables wide, and uncovers at low water, so that it is difficult even for the lightest canoes to enter. The river brings down volcanic ashes, and pieces of pumice stone, which together form both its banks and the bar, and cover part of the bottom in the neighbourhood.

Coast.—From the river Kalumpan the coast trends to the southward, forming a small bay with a beach of sand and mangroves ending in a little point at 1½ miles from the river. The bank of sand which commences at the mouth of the river Batangas and borders all this part of the coast at a distance of 2 to 3 cables terminates here. This bank dries in places at low water; the depth near its northern edge is 12½ fathoms, mud; off its south-west extreme 11 fathoms; and at its southern end 7 to 30 fathoms, which depth increases to 82 fathoms at less than 2 miles from the Batangas coast.

Pinamukan point lies S.S.W. 3 miles from the little point where the bank ends; the coast between these points is of regular height and well wooded, with soundings of 5 fathoms close to the shore, and 40 to 50 fathoms at the distance of one mile; to the eastward of point Pinamukan it forms an angle, into which flows a small river of the same name as the point. Fresh water may be obtained from this river, but with difficulty, as it is necessary to go some distance up for it, and the river is very shallow. From point Pinamukan the coast trends about S.S.W. for 3 miles to point Matoko, and is of regular height and wooded, with detached rocks close to the shore.

Anchorage.—From point Buang to point Pinamukan the whole coast is formed of sand beaches, and vessels of all sizes can anchor off it, but necessarily very close to the shore on account of the great depth of water. Between Buang and Batangas a depth of 14 fathoms, mud, will be found at less than 2 cables from the shore, and this anchorage is preferred by the vessels that frequent the coast, on account of its good holding ground and its proximity to those two towns. In case of necessity, anchorage can be had on the coast east and west of the above road, but very close to the shore and on bottom of gravel and rock.

MARIKABAN ISLAND, lying south nearly 2 miles from point Cazador, is 7 miles long E.S.E. and W.N.W., high, and covered with trees, amongst which the useful Buri palm (*Corypha Gebanga*) is frequent. On its eastern end there is a remarkable mountain that commands all parts of the island; at the western end there is another, not so high, terminating in a peak which can be seen very distinctly from the neighbourhood of cape Santiago. The whole coast of the island is bordered by rocks, and two rocky islets, named Kaban and Sombrero, lie off the north-western end, and two others, Culebra and Malajibamanok, off the eastern end.

The islet Kaban, to the eastward of the northern point of Marikaban, is one mile long north and south, of moderate height, and wooded; a shoal of one cable extent N. by S., and covered by 3½ fathoms least water, lies 2 cables north of its northern end. Sombrero islet, 40 feet high, lies half a mile north of the northern point of Marikaban, ~~and is joined to it by a chain of rocks~~; a similar islet lies close to the point and is connected with it by a chain of rocks.

Shoal.—At 9½ cables S. 28° ~~E.~~ W of the N.W. end of Marikaban there is a shoal of 4 cables extent N. by E. and S. by W., covered by less than one fathom water;* between it and the coast there is a channel 6 cables wide and 16 fathoms deep.

Culebras islet lies 3 cables E. by S. of Marikaban; it is 2 cables in extent E.S.E. and W.N.W., and wooded; some detached rocks that wash lie S.E. of it.

Malajibamanok, lying 7 cables to the eastward of Culebras, is small, flat, with a few trees on the middle, and surrounded by rocks which project to the E.N.E. about a quarter of a mile. In the channel between Malajibamanok and Culebras there is a depth of 22 fathoms water.

Reef.—The French Instructions† mention a reef extending half a mile from the north coast, with several heads out of water, bearing S.E. from point Cazador; this reef is not mentioned in the Spanish Derrotero, but the Spanish Chart, 1875, shows a sounding of 2 fathoms half a mile north of the north-east point of Marikaban.

Marikaban strait, between Marikaban island and point Cazador, is clear and safe, the only danger being the shoal that extends to 3 cables north of Kaban islet. The strait is only used by coasters, who can anchor in case of need near the island; but the tidal eddies are very violent, and the anchor must be let go so close to the rocks that there is danger of being driven on shore before it bites. The channel south of Marikaban is clear and deep, and is always used in navigating Verde island passage.

VERDE ISLAND, from which the passage takes its name, is 1,500 feet high, well wooded, and shows two peaks said to be visible at a distance of 42 miles. It can be approached with safety, though there are detached rocks close to the shore; off the south-east point there are some rocks that uncover at the distance of one cable from the point.‡ On the north side of the island there is a bay in which the depth is 10 to 15 fathoms near the shore, with a high coast, wooded, with occasional sand beaches, affording a shelter in southerly winds.

Verde island, with the south coast of Luzon to the north, and the north coast of Mindoro and Bakos islands to the south, forms the two channels of Verde island passage; both are safe, but the northern is preferred, as the southern one is interfered with by the Bakos islets (*see* page 202).

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* Spanish Derrotero gives 2 fathoms.

† Le Grand Archipel d'Asie, 1885, p. 409.

‡ French instructions say one-third of a mile.

COAST of LUZON.—Point Matoko, which forms the eastern extremity of Bantagas bay, is high, wooded, and precipitous, with one low point to the south-west. The coast to the eastward is rocky for 1½ miles as far as a sloping point (Ilijan); it then forms a slight indentation, ending to the eastward in point Arenas. In this bay small coasters find anchorage during the north-east monsoon, to avoid the ebb stream. The shores of this part of the coast are covered with the *Palo Maria*, a tree of the natural order Guttiferæ, which yields a valuable gum.

Point Arenas, the second point from Matoko, consists of sand and stones, which serves to distinguish it; it is low and clean, and the tidal streams rush past it with great force. Point Taliji, 1½ miles E.N.E. of point Arenas, is not very prominent; it is rocky and wooded: to the westward of the point good water can be obtained which comes from a valley of mount Taliji. From here to point Rosario, 2½ miles E.N.E., the coast is covered with trees, and shows a sandy beach fringed by rocks close to.

Rosario river debouches at 2½ miles from the point of the same name; it is half a cable wide at the mouth, and the two points which form the entrance are both prolonged by a spit of sand half a cable in length. The bar is one cable in width, and composed of sand and gravel with rocky patches on it; the entrance channel, which is between the bar and the north-west entrance point, is hardly half a cable wide and only 3 or 4 feet deep at low water, and 6 feet at high water, which depth diminishes further up the stream. The river divides into two branches; fresh water can be obtained from the northern one, but canoes must be used to get it. From Rosario river to Malabrigo point the shore is sandy, wooded, and of regular height.

Anchorage can be found in northerly winds for vessels of all sizes between points Matoko and Malabrigo, but the shore is very steep, and at less than 2 cables from it the depth is from 8 to 13 fathoms. Bottom, coarse sand and gravel.

Punas or Lobo point is the central point of the broad headland formed by the spurs of the Sierras de Lobo; Malabrigo point is the western, and Malagundi (or Galban) the eastern point of this headland; the coast comprised between them is of moderate height and well wooded, rocky between Malabrigo and Punas, and bordered with sand beach and rock from here to Malagundi, off which point lies a little islet surrounded by rocks. Punas point is remarkable by some red patches at a short distance from the beach, and the Sierras de Lobo, 3,363 feet high, serve to indicate the position from the south-east.

Sigayan or Lokoloko point.—From Malagundi point the coast shows the same sand beach for 4 miles to the little river Sigayan, where the high land of the Sierras behind Punas point terminates. The river is narrow and shallow, and fresh water can be obtained at a little distance from the mouth. No description of Sigayan point itself is to be found in the Spanish Derrotero.

Anchorage.—Vessels of all sizes can anchor between Malagundi and Sigayan, but close to the shore, which is very steep. The bottom is generally of coarse sand mixed with gravel.

The description of the coast to the eastward is continued in Chapter VIII.

NORTH COAST of MINDORO.—Mindoro is an island of an oval form with a prolongation of the northern portion towards the west; it is about 90 miles long by 50 wide, with an area of about 4,000 statute miles. Though an easy day's sail from Manila, this island is one of the least populous of the archipelago, being extremely mountainous, covered with dense forests, and in the more level parts near the coast full of marshes, and very unhealthy. The inhabitants of the coasts are Tagals, but in the interior there is a low tribe of Malayan race, probably the indigenes of the island, and called Manguianos, speaking a peculiar language and living in a very miserable manner on the products of a rude agriculture. There are also said to be some Negritos, but of these very little is known.

Mindoro constitutes one of the provinces of the Philippines under an alcade. The chief town is Kalapan on the north coast, and there are nine other pueblos or villages, with curés and native chiefs, all situated round the coast. The population is about 30,000, of whom 6,000 are wild tribes in the interior.*

Mount Kalavite is a long-backed promontory, the western slope of which forms cape Kalavite, and the northern slope point del Monte; the summit, about 2,000 feet high, appears dome-shaped when seen from the west, but from the north or south it shows a long ridge fairly level; the western end of this ridge is the highest part. Cape Kalavite and the coast to the southward have been described in Chapter II.

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* Australasia, by A. R. Wallace. 5th edition, page 289.

Binuangan point, 3 miles N.N.E. of cape Kalavite, resembles it in appearance, and is bold to approach, the few rocks interspersed along this part of the coast lying close in.

Anchorage.—South of Binuangan point there is a small bight with a sand beach, in front of which there is anchorage during the north-east monsoon in 5½ fathoms, sand, at 1½ cables from the beach. A rivulet of good water enters here. There is another anchorage immediately north of cape Kalavite, but it is not so good.

Point del Monte, or Santo Tomas, is of sand, with a small bank of one fathom water off it; between it and Abra de Ilo, 15 miles to the eastward, the coast is high, thickly wooded, and bordered by sand beaches. Point Bagalayag is girt with rocks which extend a mile along the coast.

Abra de Ilo is a cove between two coast hills; the shore is very low and sandy, semicircular in form, of 3 miles across, but of little depth Towards the middle there flows a river of fresh water, which can only be entered by small coasters and *bancos* at high water. The bottom is of sand, and the anchorage gives shelter to vessels of all sizes in S.W. winds, in 3 to 12 fathoms; but good ground tackle is required, as the squalls off shore are very violent. The village contains about 250 people.

Coast.—From Abra de Ilo to port Galera the coast can be approached in safety to half a mile; the coast is of moderate height, and shows a few points separated by beaches. The high land approaches the coast, and two watercourses descend from the ravine.

Point Minolo, 2 miles west of port Galera, is covered with trees; on its eastern side is a beach, before which anchorage can be had on sand and gravel. The shore is steep, and there are 25 to 30 fathoms at 3 cables from it.

PORT GALERA* is formed by a promontory from the coast of Mindoro and the islets Medio and Panikian. These islets, situated at the entrance of the bay, close it to the westward, forming the port, which is a sort of canal, or *silanga*, with two passages, one to the northward and the other to the N.W., the opening between Panikian and the coast being a blind lead (*Boca falsa*).

The flood stream passes into the port by the north-west channel and out by the north channel, and then follows to the eastward; the reverse taking place with the ebb stream. This fact must be remembered in making the port.

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* *See* Admiralty Plan, Ports in the Philippines, No. 949, scale; m = 5 inches.

From point Escarceo, the eastern point of the promontory, to the north point of Medio, the shore presents a uniform appearance, and the north channel is difficult to discover; but a signal post over the north-east point of entrance, and a remarkable white patch like a sail on the fall of the point, are marks which indicate it. The beaches are small, and the land above covered with trees.

Medio is about 8 cables in extent N.N.W. and S.S.E., clean; and the soundings round it show 4 fathoms at less than a cable's distance in general; the reef that fringes the northern shore grows out but a very little way. The north point, where there is a great tide-race, is worn away and shows bare rocks; from it to the S.S.W. the coast is high and jagged.

Panikian is a little over a mile long north and south; there is a reef on its east side, and the soundings off it are 4 fathoms at less than a cable; the north-west shore is high and rugged to the south; it ends in a sandy point forming with Mindoro a channel half a cable wide, closed by sand; this is called " Boca falsa."

DIRECTIONS.—North Channel.—After clearing the north point of Mindoro, keep in the middle of the channel, where the depth is 6½ fathoms, coarse sand and rock; it is a cable wide at the entrance, but lessens to half a cable abreast of the east point of Medio which is low and bordered with a sand-bank. The tidal streams are strong enough to expose a vessel, badly equipped, to being thrown on the rocks that terminate the points.

North-west Channel.—This must not be confounded with Boca falsa, south of Panikian. A vessel coming from the westward should steer for the middle of Medio, and on nearing it a clump of mangroves on the south-west point will be made out; she should then steer in that direction until the entrance is opened, and then keep in the middle of the channel to the anchorage. This channel is narrowed at the entrance to half a cable's width by the rocks off the south-west point of Medio, but it widens inside to 2 cables: the least depth is 6½ fathoms at the entrance, increasing inside to 15 fathoms.

During the north-east monsoon the north channel is the best, but with sailing ships, even that channel is dangerous, as calms or baffling winds may be met, and then the vessel would be at the mercy of the tide.

During that monsoon the anchorage at Varadero is preferable, although for sailing vessels going out it would be difficult at that time.

Anchorage.—The available space inside the islands is considerably reduced by projections from the promontory of Mindoro of low land with shoal water between them, and by a shoal that advances from the southern part, having on its north-eastern end rocks that wash at very low water. The anchorage is in a confined creek in the south-west part; at the entrance, which is 1½ cables wide, depth the is 6½ fathoms, shoaling towards the town at the bottom. At 1½ cables north of the mouth there is another shoal with rocks awash at low water on its southern part. Between this shoal and Boca falsa there is a space of 1½ cables width, and 7 to 10 fathoms depth, which would appear to afford better anchorage.

The town consists of 1,300 inhabitants; water is scarce.

Point Escarceo, so named from the tide rips off it, is of jagged rock, covered with trees; the shore between it and point Boaga, 1½ miles to the S.E., is clear, with deep water off it. The currents run here with great velocity, causing strong eddies.

Varadero bay is open to the S.E.; it is 4½ cables across at the mouth, half a mile in depth, and affords an excellent anchorage for all classes of vessels in both monsoons, especially during the south-west season when the heavy squalls pass to the northward of it. It is decidedly preferable to port Galera, especially in bad weather. The best anchorage for large vessels is in 7 to 10 fathoms, S.E. by E. of port Galera, at 2 cables distance from the sand beach, between two points of rock at the bottom of the bay.

Point Boaga, the northern point, is clear; but the southern point, Varadero, sends out rocks to a cable's distance which wash at low water; this point, therefore, must be given a wide berth.

Suban is a little town on the summit of a hill at a distance of 6 miles S.S.E. of point Escarceo; near the town is a bay with anchorage sheltered from the S.W. in 7 fathoms, sand.

Shoal.—The Spanish Derrotero describes a shoal growing out to the N.E. for a quarter of a mile from the western point of this bay; this is not shown on the Spanish chart, but there is on the chart a shoal of 3½ fathoms at 1½ miles east of the town. The Derrotero remarks that this reef is dangerous, as the water over it is of the same colour as that surrounding it.

The French Instructions Nautiques note that to the east of the town, at a half a mile from the shore, is the furthest point of a bank of sand and rock, on the edge of which is 3½ fathoms.

COAST.—From the bay of Suban the coast curves gently round to the eastward, and at the distance of 3 miles a delta commences formed by the washings of the river Bako and others, producing 4 miles of confused coast line, cut into by bars and passages as far as point Baliti, the western point of the bay of Kalapan.

Soundings.—From the mouth of the river Bako towards the islets Bakos the soundings are 4½ fathoms at two-thirds of a cable's distance, 75 at 2 cables, and no bottom at 109 fathoms at 3 cables' distance off point Baliti. The reef of sand and rocks extends to 3½ cables' distance.

Kalapan.—This is the capital of the province of Mindoro, and contains 4,700 inhabitants, occupied in hunting, fishing, and ordinary weaving. The commerce is insignificant. Sand-banks extend in front of the town to a distance of half a mile; to clear these the northern Silonai islet should not be shut out by point Kalapan. On this line, near the north edge of the banks, the soundings are 36 to 46 fathoms; this depth rapidly lessens towards the shore, and the anchor should be let go when the lead shows 25 fathoms to avoid shooting on to the bank.

Directions.—The safest course for entering or leaving this bay, is to keep in the middle of the passage between the Bakos islets and the coast of Kalapan; and, when the southernmost of these islets bears north to steer for the anchorage.

Point Kalapan, or **Tibao,** is low and wooded, and has on its summit a *cogonal* or reed plantation; the point is clean, but a fringe of rocks close to the beach continues to the S.E. with 40 fathoms close to it.

Silonai islets.—The small southern islet of that name is one mile E.S.E. of point Kalapan; it is shaped like a sugar loaf, and surrounded by rocks. The channel between it and the coast is only fit for coasters, having a depth of less than 5 fathoms. At half a mile from it, and one mile N.E. by E. of point Kalapan is the larger Silonai islet; it is fringed with rocks which advance on the northern side to 1½ cables distance. Between the islets the passage is 3 cables wide and 20 fathoms deep. Vessels should be careful to keep to the middle of it.

Bakos islets.—This is a group of three rocky islets extending 2 miles N.E. and S.W., situated N.N.W. 2½ miles from point Kalapan. The vicinity is foul, and the chart shows a danger on the northern side of the northern islet. A shoal of 1½ fathoms lies one mile S.W. of South Bakos. In the middle of the passage between the northern and middle Bakos there are rocks which uncover; in the other channels the depth is sufficient, but the rapid currents that prevail here should prevent a vessel from taking them.

The N.E. COAST of MINDORO.—From point Kalapan (Tibao) to Naujan, 13 miles to the S.E., the coast is low, with beaches of sand and thick wood, cut into by various rivulets and estuaries, which can only be entered by boats at high water. At a distance of one cable from the shore the soundings are 4½ to 7 fathoms, sand and mud, and at half a mile from Naujan 5½ to 8 fathoms, fine sand. The rivers to the N.W. of Naujan send out sand banks with only a quarter of a fathom on them to 2 cables distance. The chart shows a shoal at three-quarters of a mile from the shore.

Naujan river and bar.—The river Naujan can only be entered by boats, the width at the mouth being only one cable, and fronted by an extensive bar with 12 to 3 feet of water on it. There is anchorage one mile S.E. of the river in 9 fathoms, sand and mud, shoaling gradually towards the coast. From Naujan to Polak bay the coast is steep, and 37 fathoms depth will be found at a distance of one mile.

Point Tujud has a large insulated rock or cliff off its east side, joined to the coast by a rocky spit. Point Taguvan, one mile S.E. of point Tujud, has detached rocks off it, with 10 fathoms of water near them.

Polak bay, open to the N.E., is clear of dangers ; the depth at the mouth is 35 fathoms, lessening to 9 fathoms at 2 cables from the beach at the bottom of the bay. Point Anahauan, the N.E. point, is fringed with a reef to a distance of 3 cables from it, with 2½ to 5 fathoms at its edge. The bottom of the bay is a sand beach, 2 miles long, between two rivers ; fresh water can be obtained in boats from the eastern river.

Point Dumali, the eastern extreme of Mindoro island, and formed by the termination of the shoulder of mount Dumali, is high, peaked, and easily recognised by a great white patch 400 feet above the sea. The soundings are 49 fathoms off the point, and 37 fathoms at less than a mile from the rounded coast to the southward.

DIRECTIONS for Verde island passage.—After rounding Cape Santiago at the distance of a mile, S.E. by E. ¼ E. is a good course until abreast the south point of Marikaban island, and thence to pass between Verde island and point Matoko, in Luzon. Verde island can also be passed on the south side, as the ledge of rock on the S.E. point of Verde does not project more than a cable's length, and the northern Bako is clear at a short distance ; but the north channel is generally preferred.

When the N.E. point of Verde island is passed, a course S.E. ½ E. will lead one mile east of the northern Bako islet, and, if continued for 40 miles, will pass 4 miles north-east of Dumali point ; thence a course S. 8° E, may be steered to pass down the west coast of Panay.

EAST COAST of MINDORO.—From point Dumali, south as far as Pinamalayan river, the shore is steep-to ; from there on to point Dagayan the coast is clean, and consists of sand beaches which may be approached without danger to within a mile, and vessels can anchor anywhere along it, sheltered from westerly winds, in 4 fathoms at a distance of 2 miles, and in 3 fathoms at one mile. In the elbow of the coast N.W. of point Abongabon, off the river Masi, there is excellent anchorage for all vessels in S.W. gales, in 4 to 7 fathoms, sand. A reef of rocks awash at low water extends 2 cables out from the river. The charts do not show many soundings about this coast.

Point Dayagan is flat and sandy, steep-to and clean, with 4 and 5 fathoms depth at 1½ cables from it.

Point Tiklin or Lagaoin, 4½ miles S.W. of point Dayagan, is flat and sandy ; at less than half a mile E.S.E. of it, there is a bank of rocks of one cable extent, uncovered at low water, with 3¾ fathoms at its edge. One mile further out to the S.E. there is another bank, of 3 cables extent, awash at low water, with 4 to 8 fathoms at its edge. The channel between these shoals has 15 fathoms in the middle.

Mansalai bay is small but well sheltered, with good holding ground Vessels of all sizes can anchor in it, sheltered from all winds except the S.E. The best anchorage in the N.E. monsoon is in the north of the bay, in 7 fathoms, mud, at 2 or 3 cables from the shore. The town of Mansalai is small, of 300 persons. Water can be had from a rivulet, but with difficulty, as boats cannot enter it.

Directions.—In coming to this anchorage from the north, do not bring point Dagayan to eastward of north until the entrance of the bay is made out to the west, in order to clear the Lagaoin banks which partly uncover at low water. In entering the port, care must be taken not to approach the north shore which is bordered by a reef. There is a depth of 5 fathoms in the middle of the port, and in the southern part one to 3 fathoms, sand, at 3 cables from the shore. On the north coast of the bay there is a hill of some height with two remarkable peaks, which serve to mark the port on coming from the south.

Point Mansiol is wooded, and can be distinguished by the two islets near it to the E.N.E., both surrounded by rocks. South of the point is a little bay, in which coasters can anchor in 5½ fathoms.

Buyallao island* is 1½ mile in extent N.W. and S.E., of regular height, densely wooded, and fringed with rocks on its N.W. side to one cable distance; two sharp pointed rocks are at its N.E. end.

Point Buyallao is of peaked rocks, covered with trees, with little hills in the interior by which it may be easily distinguished. It is clear, and has a depth of 8 fathoms at its sides.

Soguikai bay is bordered with steep beaches near which are rocks; the depth is 7 to 18 fathoms at one cable from the shore; small vessels can anchor in case of necessity in one of the creeks in the bay.

Soguikai island is low and surrounded with a reef; the passage between this island and the coast has 15 fathoms. There are rocks to the N.W. of the isle.

Point Pandan is round and of middling height; a reef advances 1½ cables from it with 5½ to 7 fathoms, rock, at its edge. (The chart shows 4 fathoms at half a mile S.E. of the point.)

Tambaron isle is safe and steep, and separated from Pandan peninsula by a channel half a cable wide and 8 fathoms deep, rocky bottom.

Masin isle is also safe and steep except on the south side, off which there is a reef. On the west side there is a little bay where coasters can anchor.

Bulalakao bay offers shelter from all but southerly winds; it has 23 fathoms at the entrance, and 12 fathoms in the middle shoaling to 4 fathoms, sand, near the sand beach at the head, where three rivers enter near the village of Bulalakao. The east coast of the bay is covered with trees, and on that side there is a little cove named Laurigau, sheltered from all winds, with a depth of 13 to 16 fathoms, mud. No supplies can be obtained at Bulalakao.

The islets Alibatan, Silat, and Aslom, are surrounded with rocks. The passages formed between them, and with the coast of Mindoro, are clear and deep. There is a little anchorage for coasters between Aslom and the coast of Mindoro.

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* *See* Admiralty chart:—Semirara, Ilin, and Ambolon islands. with part of Mindoro; No. 971, scale, $m = 1{\cdot}0$-inch.

Point Burankan is free from danger, and can be passed close-to. Pandarochan bay is described in Chap. II. (p. 71).

The SEMIRARA ISLANDS form a group of eight islands, all surrounded by reefs.

Semirara, the largest of the group, is hilly, about 512 feet high at the highest part. The west coast includes several little bays almost entirely obstructed by reefs, on the edge of which are depths of 4¾ to 13 fathoms; and off the town of Semirara, which stands on the top of the hill facing the largest bay, the anchorage is very bad even for coasters. The east coast is bordered by a reef which extends about a mile from the N.E. part of the island; on coming from the north this coast of the island must not be approached within 3 miles until the town of Semirara bears full west. There is anchorage at the south of the isle in 5 to 8 fathoms, sand, during the N.E. monsoon. Good coal for steaming purposes was found on the island by Captain Villavicencio of the Spanish navy.

Libagao island is small, 410 feet high at its northern part, while the southern part is low and sandy, terminating in a reef which grows out more than a mile.

Nagubat is small and flat; at 1½ miles to the eastward is a shoal of 4½ fathoms which appears to unite with the island. The channel between Nagubat and Libagao is deep, as well as that between Nagubat and Semirara; vessels can pass at one cable from the south part of Nagubat.

Kaluya is 623 feet high at the south part; there is a bay on the west of the island with low shore and sandy beach, on the north-east part of which there is anchorage in 5½ fathoms with the north part of the bay bearing N. 27° W. and the south point S. 6° W.

Sibaton is separated from Kaluya by a channel of 3 fathoms which appears practicable for very small craft. It is 111 feet high and unsafe to approach.

Sibolon, 148 feet high, is also unsafe to approach.

Sibai is 213 feet high; its N.W. point rises to a peak and is clean, and its north coast can be passed at half a mile distance, but the west side is unsafe.

Panagatan reef has already been described in Chap. II. (p. 74).

ISLANDS EAST OF MINDORO.

Maestre de Campo island, lying S.E. 11 miles from the S.E. shore of the lofty promontory formed by Mount Dumali in Mindoro is of circular form, 3½ miles in diameter, high, mountainous and thickly wooded, with very steep shores, only affording anchorage to small craft. The summit of Maestre de Campo, when seen from the eastward appears like a ridge with three distinct hillocks, estimated to be 700 feet high.

Port Concepcion* on the S.E. side is the principal anchorage; it is very small but deep and easy of access, of 5½ cables width at the mouth between point San Martin and point Fernandez, and of the same extent N.N.W.; a tongue of land advancing 4 cables S.S.E. from the head of the port divides it into two bays; in the westernmost of these there is anchorage for very small vessels in 8 to 10 fathoms, sand and mud, in front of the town of Concepcion. The interior of the port is lined by a rocky steep reef.

Dos Hermanas are two flat islets of rock, 138 feet high separated by a deep channel 1¼ miles in width; the shores are clear and steep.

Banton island is 1,918 feet high, peaked and rugged, and steep on all sides except the S.E., which is bordered by a reef of small extent. It presents some shallow bays, and on the N.E. part is a village of some size, near which is anchorage for coasters in 5 fathoms, with a hawser to the shore to prevent swinging. On the west coast there is good anchorage in the N.E. monsoon in 7 fathoms, sand, between the N.W. point of the island, and a tiny islet south of it, Good scope of chain would be required as the anchor is liable to slip off the steep bank.

Bantoncillo islet, 256 feet high, lies S.W. 3 miles from Banton. It is three-quarters of a mile long, north and south, and very narrow; off its southern end is a pinnacle rock. There are 73 fathoms off the N.W. end, and off the S.E. end 45 fathoms, almost touching the extremities of the island.

Simara island is 870 feet high, flat topped and well cultivated, and can be approached with safety. There are 40 fathom soundings at half a mile from the northern end; on the south side there is a village with a church and fort, but there is no anchorage off the island.

TABLAS ISLAND is mountainous, and on its northern extremity is the peak Cabezo de Tablas, 2,405 feet high; generally the coasts are clear and steep to. Off the north end are two rocky islets, distant one cable from the coast; the larger one is clear and steep, the smaller one has rocks round it, close to. On the west coast there are anchorages for small craft in the N.E. monsoon, and on that side is the sheltered port of Loog. From point Bagulayan, the S.W. point of a wide bay on the west coast, a reef projects a mile to the northward ; the chart shows 10 fathoms near its end.

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* *See* Admiralty plan, Ports in the Philippines, No. 949, $m = 0·75$ of an inch.

Port Loog.[*] is the only shelter on the west coast of Tablas during the S.W. monsoon. The port is about 4 miles in extent north and south, and 3 miles east and west. The shores are steep, and the depth of water is from 11 to 20 fathoms, mud. The entrance points are more than a mile apart, but the channel is reduced to the width of half a mile by a reef that projects to a distance of 6 cables from the northern point. Within and before the mouth there is a shoal of rock 4 cables long, N.E. and S.W., and 2 cables wide ; steep to, with depths of 5½ to 9 fathoms on the south side. The town of Loog, of 500 inhabitants, is on the north shore.

Anchorage.—During the N.E. monsoon, vessels of all sizes can anchor on the north side of the harbour, before the town, in 9 fathoms ; and during the S.W. monsoon, on the south side at 3 or 4 cables from the shore in 15 fathoms, mud.

In entering port Loog, the southern point of the entrance should be made for, and sailing vessels, working in, should be conned by sight.

Water.—Near the northern side of the town of Loog, there is a river of good water in which light boats can enter.

Point Kabalian, the south point of the island, ends in a sand beach, with 11 fathoms at the edge, and no bottom, with 100 fathoms at a short distance.

Point Kalaton, on the south-east coast, is formed by a high bluff, which advances 1½ miles from the coast, with soundings of 5½ to 12 fathoms alongside it. In the bay, formed by the point, and the islet Kabahan to the southward, there is anchorage in 5½ to 11 fathoms, with point Kalaton bearing N.E.

Shoal.—At 5 miles north of point Kalaton and 2½ miles from the coast near the town Lanan, there is a shoal of sand and rock 1½ miles in diameter, with 5½ fathoms on the shallowest part, and no bottom with 100 fathoms near the eastern edge.

Tambolon bay is the name of the wide bay to the southward of the Cabezo or N.E. point of Tablas ; in this bay vessels can find shelter in the S.W. monsoon, but the water is very deep. There are 8 fathoms very near the coast, bottom fine sand, with the western entrance to port Romblon, bearing E. by S.; the shore is steep, bordered by rocks very close to it. From the southern part of the bay, 4 miles from the N.E. point, a ledge of rocks juts out to a distance of three-quarters of a mile.

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[*] *See* Admiralty Plan, Ports in the Philippines, No. 972 ; scale, m = 3·7 inches.

The channel between the N.E. point of Tablas and the islands Romblon and Cobrador, is 3½ miles wide and free from danger. It is the passage usually taken from Verde Island passage to Jintotolo channel.

Karabao island is hilly, and rises to a peak of 718 feet height. Its shores are clear and steep; the rocks that fringe it are very close; on the east side there is a sand beach where, in need, vessels can anchor in 5 fathoms.

The channel between Karabao and Borakai is clear, but the tide-streams are very strong. The flood makes to the east and the ebb to the west.

Romblon and the islands to the eastward will be described in the next chapter.

Borokai island lies one mile to the northward and westward of point Potol in Panay, and extends 4 miles N.N.W.; the summit is 436 feet high; the shores are safe. On the west side there is 5½ fathoms, where anchorage can be had if required; the channel between it and Potol is clear, but there are rocks on both sides of it, and the tide-streams rush through it with great force.

PANAY ISLAND is situated to the south-east of Mindoro and is about one-fifth larger. It is of an irregular quadrangular shape with three projecting angles, that at the south-east being rounded off; but here the island of Guimaras, separated by a very narrow strait, appears to have once formed another projection. A chain of mountains runs in a curved line from the north-western to the southern promontory, and from the centre of this, another chain branches off to the north-eastern promontory, thus dividing the island into three natural districts, which form the provinces of Antiki, Kapis, and Iloilo.

Panay is exceedingly fertile, being well irrigated by numerous mountain streams; and it supports a large population of Bisayas, with a few Negritos in the mountains. It produces rice in abundance, sugar, cotton, coffee, tobacco, pepper, and cacao. Ebony and Sapan-wood are obtained from the forests, while pearl shells, tortoise-shell, and tripang are found on its coasts. It is the most densely peopled and highly cultivated island of the group, having over 860,000 inhabitants. It has three large towns—Buenavista, Kapis, and Iloilo, the latter a free port, and a place of very large trade—and seventy-four villages. Each of the provinces of Panay is under the administration of a governor. There are no volcanoes in the island.*

Point Potol, the northernmost point of Panay, is flat and sandy, with a few trees over it; to the east of the point, and at less than a mile from it there are detached, sharp-pointed rocks.

WEST COAST of PANAY.—The promontory rising to 1,857 feet above the sea, and forming the north-west extremity of the island of Panay, terminates in this part in a clear and steep coast, the most salient points of which are those of Nasog and Pucio.

Point Nasog, the N.W. point of the island, is a wooded bluff ~~718~~ feet high—safe and steep; on its northern side is good anchorage in 5 fathoms, sand, before the village and river Malay. 712

Point Pucio, 8 miles S. by W. ½ W. of point Nasog, and similar to it, is 620 feet high, and girt with rocks which project to some distance.

The anchorage of B~~a~~oroanga is between the two points in a little bay, with a depth of 3½ to 4¾ fathoms before a beach, near the mouth of a little river. Between Baroanga and point Pucio, the coast is fringed with detached rocks; the largest of these are clear, but the lesser ones throw out reefs to the distance of half a mile; above these rocks the coast presents high rocky cliffs with cascades falling over them.

See Suppl 1902

The Coast from point Pucio is safe, with good depth near it; it is bordered in general with sand beaches. Two lines of hills run parallel to the coast; their slopes are cultivated and dotted with churches.

Pandan bay is safe, steep, and deep, but offers little shelter. The town of Pandan, of 9,400 inhabitants, is in the bend of the coast with the little river Bugang running 2 miles to the west of it.

Shoal.—A bank with 1~~¾~~½ fathoms on it lies 1½ miles N. 72° W. of the village Alipayao, 8 miles to the south ward of Pandan.

Manignin island, 13 miles to the south-west of point Pucio in Panay, is small, with an elevation of 150 feet in the centre; it is fringed with a narrow, steep, reef. On the south-west side is a village enclosed by a strong palisading.

Batbatan isle, at 16½ miles S. 15° E. of point Pucio, and 8½ miles west of point Lipata, is about 400 feet high, with a central hill; on the N. and N.E. sides there is a reef, but otherwise it is safe and steep-to. The channel between it and the coast is clear.

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* Australasia, by A. R. Wallace. 5th edition, page 289.

Carmen bank, 11½ miles S. 16° W. of Manignin, and 15½ miles S. 71° W. of Batbatan, is of sand and coral; it is circular, of 2 miles diameter; the least depth on it is 4½ fathoms, nearly in its centre; on the rest of the bank the depth is from 7 to 23 fathoms. The following bearings were taken from its north end by the Spanish surveyors:—centre of Seco island S. 33° 30′ E.; point Pucio N. 28° E.; centre of Manignin N. 16° 32′ E. The first of these bearings place it in 11° 23′ 08″ N. and 121° 37′ 24″ E.; but Batbatan with point Pucio, which was not clearly seen, place it more to the westward, and Manignin still more so, which makes one suspect that perhaps this island is, in fact, nearly a mile to the eastward of its assigned position.

Seco, or Pontud.—The south-east point of this islet bears S. 37° W. 15 miles from Batbatan, and S.E. by S. nearly 3 miles from Carmen bank. The dry part of Seco bank, which is less than one cable in extent, and about 26 feet high, is covered with trees, probably mangroves; at low-water rocks dry out at 3 cables from the sand. The soundings at three-quarters of a mile from the islet are 38 to 70 fathoms.

A recent notice (1884) states that breakers extend to the northward one mile further than indicated on chart.

Sultan bank has already been described in Chap. II., page 83.

Point Lipata, formed by a tongue of land that advances one mile to the westward, is surrounded by a narrow reef; there is anchorage to the north of it in uneven depth from 5½ to 23 fathoms, which is the only good anchorage on the coast during the S.W. monsoon.

Maralizon islet, at 3¼ miles S.W. by S. of point Lipata, and 2 miles off the coast, is of medium height and unsafe; a reef advances one mile from it to the eastward and half a mile to the westward. On the coast, facing the islet, is the town of Kolasi, of 10,800 persons.

Shoals.—In front of the town of Tibiao, of 5,800 persons, between Kolasi and Nalupa, there is a bank with 6 fathoms on it; and before the town of Nalupa, of 5,000 persons, there are rocks awash; and a coral bank with 1½ least water on it, lies at 2½ miles W. by N. of the town.

The coast from Nalupa to point Dalipé continues clear, with deep water near it; it consists of sand beaches forming slight indentations, and is cut into by several rivulets. Several small towns are on the shore. The river Sibalon, 5 miles north of point Dalipé, has two mouths; both have bars on which the water is less than one fathom. At a mile south of the river is the town of S. Pedro, of 6,400 persons.*

Point Dalipé is low, and fringed with a narrow strip of rock.

To the southward of point Dalipé is a sandy bay lined with rocks, having on its northern extremity the town of San José de Buenavista, the capital of the province, containing 5,200 persons, and on its southern the town of Antiki, of 9,700 persons. Provisions can be procured at both these places, as well as wood and water.

The anchorage is to the southward of the town of San José, and near it, in 6 to 7 fathoms, sand, well sheltered during the N.E. monsoon. The river Malando~~l~~ enters the bay a little to the south of the town; its depth is 1½ fathoms. There is active coasting trade between San José and Iloilo, distant 70 miles.

The coast from Antiki to point Anini is very steep, and bordered by a sand beach. Several rivers cut through it, and there are several towns along it, the principal one of which is Dao, of 7,000 inhabitants.

POINT NASO, the wide south-west extremity of Panay, is formed by the termination of the coast range; it is clean and steep-to, and is fronted by the islet Nogas off its south-west point, and the islet Juraojarao, 3 miles to the eastward of Nogas.

Nogas island is off the point and village of Anini; it is surrounded by a reef, and forms with point Anini a narrow channel suitable for small craft. In the middle of the western entrance is a reef of a quarter of a cable diameter, with 2½ fathoms on it. Gun boats can anchor east of Anini during the N.E. monsoon in 1½ and 2½ fathoms, sand. It is not advisable to anchor between Nogas and Juraojarao, as the bottom is rocky.

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THE SOUTH COAST OF PANAY trends N.E. for 15½ miles to the point Talisaya, near San Joachin, and this part of the coast is high, clean, and steep-to; from that point it trends E.N.E. for a distance of 21 miles to the town of Oton: this part of the coast is low, but free of danger till near Oton bank. From Oton to Iloilo, 5½ miles, the shore continues low and clothed with mangroves. The bights along the coast have deep water, and a vessel can work close in shore, or from point to point with perfect safety; the wind scarcely ever blows on land, but there is no good anchorage as the coast is steep and the holding ground is not good.

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* *See* Admiralty chart, Sulu or Mindoro Sea, Eastern Part, No. 2578; scale $m = 0{\cdot}1$ of an inch.

Oton bank is a bank of soft muddy sand, which commences less than half a mile W.S.W. of the fort of Iloilo, and stretches for 6 miles to the W.S.W.; it then turns S.W. for 3 miles, and finally curves back to the eastward towards point Kabalik. This bank is said to be increasing to the westward. The depth on the ridge in the middle of it is generally 1½ fathoms with two patches of half a fathom, and on the other parts from 3½ to 5 fathoms, the width, from 4 cables at its eastern end to near a mile about its western part; but it is said to vary with the monsoons. The western limit of 5 fathoms is shown on the chart to lie S. 24° W. of the town of Oton, and the southern limit to be S. 85° W. of the rugged point, 150 feet high, one mile S.S.W. of point Kabalik.

Oton bank is composed of shifting sand, and vessels should not attempt to cross it. The northern channel between Oton bank and the coast of Panay, which formerly had at its eastern end a depth of 3½ to 4 fathoms, has shoaled considerably, and pilots have declined, since 1878, to take vessels drawing even less than 13 feet through it.

Directions.—After rounding point Naso steer E.N.E. for Sta. Ana on the coast of Guimarás, and as the coast is bold stand in until points Kabalik and Bondulan are in line; then steer straight up, passing a quarter of a mile off point Kabalik, and 200 yards off point Bondulan. Strangers are apt to mistake points Bondulan and Dapdap (the latter is at the northern entrance of the harbour) for points Kabalik and Bondulan, and thus steer on to the Oton bank. The pilots live on Guimarás island, and come off on a vessel approaching point Kabalik.

GUIMARÁS ISLAND, in front of Iloilo, is 23½ miles long N.N.E. and S.S.W., and 10½ miles wide, and forms with Panay island the strait of Iloilo. It is high and hilly, especially on the eastern side, where the hills Jaljat, Pandan, and Akdan rise; in clear weather these hills can be seen from point Sojoton on the west coast of Negros. The S.E. coast is bordered by a number of islets, which renders the navigation very difficult. The island is fertile, and contains about 6000 inhabitants.

Point Kabugao, at 1⅓ miles from the mouth of the river Dumangas in Panay, forms the north end of the island; it is rounded, and has detached rocks off it; from it the coast trends about S.W. for 7½ miles, forming capes and bays up to point Bondulan, opposite Iloilo, which is high and steep. A bank of 1½ to 2½ fathoms depth stretches out 3 cables off the town of Tilat or Buena Vista; from point Bondulan, a large bank of one to 4½ fathoms extends S.W. for 1½ miles. Point Bondulan, in line with Iloilo fort, clears this bank.

See Supplement 1902

Point Kabalik, which is clean and bold, lies 3½ miles S.W. by S. of point Bondulan; this point should be passed close to in taking the channel south of Oton bank, which is here 6 cables wide, but looking from the westward Kabalik is not easily distinguished, being no higher than the rest of the coast, and, in fact, is not so conspicuous as the point 150 feet high without a name, which is one mile S.W. by S. of it, and also clean and steep-to. From the south, or Sta. Ana, Kabalik point is, however, easily recognised. From this point the coast turns south for 4½ miles to port Sta. Ana, and is bold, with several little islets close to it.

Port Sta. Ana* is a little port, clear and deep, open to the west, and easy to make; the entrance is half-a-mile wide. Inside, to the northward, is a point (marked E. Pt. on the plan), with an islet to the westward of it, and a rock awash at low water two-thirds of a cable to the S.W. of the islet. The plan shows a shoal of one fathom extending one cable south of the point. The anchorage is in the middle of the port in 6½ fathoms. Water can be obtained from a rivulet at the bottom of the port. It is high water, full and change, at 12 hours; springs rise 5½ feet.

Igan bay, immediately south of Santa Ana is clear, with a depth of 11 to 13 fathoms in the middle, and 2½ to 5½ fathoms at the edge of the bank that borders the shore.

Point Lusaran, the south-west extremity of Guimarás, is safe and bold to the south and east of it; to the N.W. there are several rocks, and an islet surrounded by reefs, and at 2½ miles N. 60° W. of the point there is a rocky shoal.

The south-east coast of Guimarás is foul, and skirted by islets and rocks which form narrow channels that can only be navigated by experienced pilots.

GUIMARÁS STRAIT, between this island and Negros, is 6½ miles wide, but the passage is reduced to 1½ miles by the islets and banks at the southern entrance. Hampulugan island is the most remarkable in the strait; between this island and Guimarás there are six steep rocks with flat summits, on some of which are trees; to the northward of it are two little isles connected with it on the south-east by a bank having 1¾ fathoms water on it; between this bank and the reef off Pandan (on the coast of Negros), is a channel of 1½ miles wide and 4½ to 8 fathoms deep; it is the least dangerous passage to take, but care must be taken to avoid a bank not sounded out, shown on the chart between Pandan and the islet of Nadulao; as also a bank of sand with 1½ fathoms over it, of 4 miles extent, which lies 3 miles S.E. to S.S.E. of Ilampulugan.

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* *See* Admiralty plan:—Ports in the Philippines; Port Sta. Ana, No. 2391; scale, *m* = 2·0 inches.

The east coast of Guimarás is clear, and a depth of 5½ fathoms will be found at a distance of one mile from it.

Unisan islets are a group of rocks that lie about 8 miles S.E. of point Lusaran; they are surrounded by reefs, and at one mile N.W. of them is a little rocky patch; the islets and the patch occupy an extent of 2½ miles. The soundings in the neighbourhood show 6½ to 8 fathoms to the northward, 20 fathoms at less than a mile to the eastward, and 4 to 6½ fathoms in the channel between them and the islet Guinanon.

ILOILO.*—The town of Iloilo stands on a low sandy flat on the right bank of a river; at the end of this flat is a spit on which a fort is built, and close to which there is deep water. Vessels of moderate draft (15 feet) can ascend the river a short distance, and lie alongside wharves which communicate with the merchant houses; but large vessels must anchor outside near the spit. It is a town of great commercial importance, and a brisk coasting trade is carried on from it. The better class of houses in Iloilo are built on strong wooden posts, 2 or 3 feet in diameter, that reach to the roof; stone walls to the first floor with wooden windows above and an iron roof. The poorer class of dwellings are flimsy erections of nipa, built on four strong posts. The roads and bridges are in a deplorable condition and almost impassable in the rainy season.

The chief imports are Australian coal, and general merchandise from Europe, but most sailing ships arrive in ballast.

The exports are sugar, tobacco, rice, coffee, hides, and hemp; it is also the principal place of manufacture of piña, jusé, and sinamoya, a tissue greatly in use amongst the Philippines. In 1883 93,750 tons of sugar were exported, principally to America.

Typhoons do not occur regularly, but in most years the tail of one passes over the place, which suffers also from the visitations of locusts.

The population of Iloilo is about 13,000, and that of Molo, which adjoins, it about 1,600; Jaro, which is at a distance of 2 miles from Molo, is larger, and is the chief market town.

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* *See* Admiralty plan:—Ports in the Philippines, No. 2,391; port Iloilo; scale, $m = 1$ inch.

Supplies.—Provisions of all kinds can be obtained, but the prices are higher than at Manila. In 1886 beef was 12½ cents a lb., bread 11 cents, vegetables 11 cents, fowls $2 a dozen. Water is scarce, and is brought across from Guimarás in tank boats; it is supplied to the shipping at the rate of $1 a ton; the Europeans depend mainly upon rain water.

There are no docks, nor means for effecting repairs; marine stores are not procurable.

Coal.—There is generally about 500 tons in store, chiefly Australian; it is kept for the supply of local steamers that take in what they require alongside the wharves. Vessels in the roads can have it brought off in bulk in lighters or schooners at a cost of 50 cents a ton. Coolies can be hired at 75 cents per ton, but they will not coal vessels if they can get other work. Notice is required the day before coaling, as men are not kept in readiness. Price of coal in 1886 was $11 per ton.

Mails.—There is regular weekly communication with Manila, which is 250 miles distant; the steamers generally arrive on Monday, and leave on the same or the following day; there are, besides, casual steamers, and other small steamers carrying on the local trade to Antiki and Negros; but most of the small coasting traffic is conducted in schooners.

Tugs are generally procurable from amongst the small steamers, and sailing vessels are generally towed out past the Oton bank.

River Iloilo.—From the town to the sea the river makes two sharp bends, and, flowing with great force to the eastward, forms (between two banks consisting of its own deposits) an entrance channel, running N.W. and S.E., of two-thirds of a cable width, and 1½ fathoms depth at low water. The mouth of this channel is ordinarily marked by two stakes on the edges of the banks; near the southernmost is the house of the port pilots. In entering, the southern shore must be kept, as it is the deepest, and as the bank projects from the north side; within the bar the channel widens and the depth increases to 16 and 22 feet.

Anchorage.—The best anchorage for vessels drawing under 13 feet is within the river, off the wooden jetty near the warehouses. Vessels of more than 13 feet draft must anchor outside; there the best anchorage is with the fort bearing S.W. ½ W., and the light-house at the entrance N.W. ½ N. The *Challenger* anchored south of the spit with the fort bearing S. 75° W., and the right extreme of the spit N. 2° W., in 10 fathoms at a cable's length from the shore, as it is convenient for landing and walking up to the town ; but the captain of the ship *Panay*, who has been trading here for many years, reports that in south-west winds a heavy sea sets in which prevents landing. Abreast of the fort the eddies are strong and irregular, on the flood.

The anchorage recommended is off the entrance of the river, with the north end of the fort spit bearing nothing northward of west. Abreast of the fort the eddies are strong, and irregular on the flood ; it is necessary to moor.

Tides.—The tidal streams reach a strength of 3 knots an hour, and they turn at high and low water by the shore. It is high water, full and change, at 12 hours ; springs rise nearly 6 feet.

LIGHTS.—A *fixed* red light is exhibited on the southern side of the entrance of the river Iloilo ; it is elevated 20 feet above the shore and 24 feet above the sea, and is visible 9½ miles, through an arc of 240°, between the bearings of N. 7° E. and S. 53° E. The lighthouse is painted *grey* and the lantern is of a copper *yellow*.

Directions.—Approaching Iloilo from the south-westward, steer in with point Bondulan bearing N.E. ¾ N., until the remarkable clump of trees on the north side of the river Iloilo is half its width open of the point ; this clears Oton bank ; and when abreast the sandy beach, which is one-third the distance from point Kabalik to point Bondulan —keeping the point south of point Kabalik open—edge to the westward until the fort is open of point Bondulan, and round this point with the south-east angle of the fort in line with point Dapdap.

The approach to Iloilo from the northward and eastward will be described at the end of the next chapter.

CHAPTER VI.

VERDE ISLAND PASSAGE TO ILOILO, EASTERN ROUTE; ROMBLON, SIBUYAN AND MASBATE ISLANDS, NORTH AND EAST COASTS OF PANAY.

Variation 1° 0′ East in 1890.

During the S.W. monsoon the eastern route to Iloilo is generally taken, thus:—The Verde island passage is followed as far as point Dumali, and then the route lies east of Maestro de Campo, south of Simara, between Tablas and Romblon; thence to pass 2 miles south of Jintotolo island, and from there down the east coast of Panay to Iloilo.

The islands Maestro de Campo, Hermanas, Simara, and Tablas, have been described in the last chapter; it is now proposed to describe the islands Romblon, Sibuyan, Masbate west and east coasts and the islands to the southward of it; then the north and east coasts of Panay with the adjacent islands; and, finally, the eastern part of Iloilo strait.

The channels.—Between Tablas and Simara the channel is 6½ miles wide, and between the north-east point of Tablas and the islands Cobrador and Romblon 3½ miles wide, both are free from danger. The flood stream sets to the east between Tablas and Simara, and to the south between Tablas and Romblon. The north coast of Tablas is clear and steep-to; the track passes nearly 2 miles outside the islets off the north point mentioned in the last chapter.*

ROMBLON ISLAND, 6 miles to the eastward of the N.E. point of Tablas, is hilly, and is composed chiefly of quartz, marble, and slate; it is 8½ miles long, north and south, and 4½ miles wide. On its N.W. part are the islands Cobrador, Alad, and Lugbung; the last lies in front of the small but sheltered port of Romblon.

Cobrador, 4 miles to the N.N.W. of Romblon, is clear and steep-to, except on the S.W. part, which is bordered by a reef to the distance of 2 cables.

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* *See* Admiralty chart. Between St. Bernardino and Mindoro Straits, No. 2,577; scale, *m* = 0·1 of an inch.

Alad, 7½ cables from the N.W. coast of Romblon, is about 1¾ miles long, east and west, and 1¼ miles broad, high, clear, and steep-to; 2½ cables south of its southern point (Bombon) is the islet Tinang, joined to it by a rocky reef.

Lubung is 1⅓ miles long. N.E. and S.W., narrow in the middle, but wide at each end, on which are two hills. From the northern point rocks extend one cable, and from the S.W. point 2 cables.

The passages formed by Alad and Lubung with Romblon are of great depth with rocky bottom; the widest and best is the northern passage, between Alad and Romblon; it is 8 cables wide, and the shores on both sides of it are clear and steep.

Currents.—The currents in these channels are strong, and care must be taken to keep in mid-channel; the flood tide sets to the south, and the ebb to the north.

LIGHTS.—On point Sabang, the northern point of Port Romblon, there is said to be a fixed light, but it is not an official light, and cannot be depended on; it can hardly be seen outside the islets.

PORT ROMBLON,* between points Sabang and Rosas, is divided into two by point Agbatan.

All these three points send out reefs; that from Sabang projects 4 cables to the S.W., that from Agbatan 2 cables to the west, and that from Rosas and the next point further in, to less than a cable to the northward.

Anchorage.—The northern port is 5½ cables wide between the point Sabang and Agbatan, but only 2 cables wide between the reefs that line the interior; the depth off these reefs is about 16 fathoms, the depth of the middle of the bay is not indicated; the entrance between the extremities of the reefs from the above points is 2½ cables wide and 27 fathoms deep. The anchorage in the southern port is only 1½ cables wide, but as sheltered as a basin; the depth near the sides is 5 to 15 fathoms, that in the middle is not indicated. The town is near the beach at the bottom of the port and carries on a trade in coco-nut oil. It contains about 5,700 persons and is well defended against pirates.

Supplies.—Cattle are plentiful; and excellent water can be obtained coming from the hills that surround the port.

Coast.—From the little islet, Bungud, off the S.W. point of port Romblon, the coast runs 2½ miles to the southward, forming three bays; the first two are foul, but in the last and most southern one which is one mile wide and half a mile deep, there is anchorage in 6½ to 10 fathoms at a distance of one cable from the shore.

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* *See* Admiralty plan:—Port Romblon, No. 972; scale, $m = 3{\cdot}7$ inches.

From the southern point of this bay, point San Pedro, the coast trends to the S.S.E. for 2 miles, to the S.W. point of the island, forming two more bays; the northern of these is shallow, and appeared to be foul; the southern one has a depth of 5 fathoms at one cable from the beach, before a stoccade of nipa.

From the S.W. point of the island, round the south to the east, the shore is clear and very steep, with a depth of 50 and 90 fathoms at a short distance. The east and N.E. shores are clear, and like the whole coast of this island, can be approached to half a mile.

SIBUYAN ISLAND is mountainous, and rises in the centre to a peak 6,424 feet high, visible 75 miles off in clear weather; this peak is also named Sibuyan. The island is 17 miles long N.W. and S.E. and 9 miles wide. The north coast is unsafe and bordered by rocks, and the N.E. part is fringed by reefs of sand and rocks, to a distance of nearly 2 miles; but from the east point round to the southward, and the south shore, it is, on the contrary, clear of all dangers; it presents fine sand beaches, and good anchorages; on this side of the island are all the villages and the cultivation.

Coast.—Point Kabodiangan is the western point of the island; from it the coast trends S.S.E. for 3 miles to point Bolabok, and then S.E. 8½ miles to point Kantingas, forming a bend two miles deep, into which flow several streams, and the river Mabalog or Espana, one of the principal rivers in the island. This river, though it has a depth of 2 fathoms inside at low water has only 1½ feet on the bar, which therefore can only be crossed at high water. The shore of this part of the coast is of coarse sand, and the soundings are 4 to 6½ fathoms at one or two cables from it, falling quickly to 50 and 60 fathoms at the distance of 2 miles.

Point Kantingas is low; there are rocky patches N.W. and S.E. of it near the coast, covered by 1½ to 3 fathoms water, with 6 and 7 fathoms near, and the Spanish chart shows soundings of 4½ fathoms at one mile N.W. of point Kantingas, and three-quarters of a mile from the coast; therefore vessels of large draught should not approach the shore closely here.

Pagalad is a town of 500 persons, situated in a beautiful valley between three hills; a reef of small extent lies in front of the town, and to the west of it is a sandy point, clear, with 5 fathoms depth near the shore.

Point Kauit is a tongue of coarse sand, low and flat; on its western side, very near the shore, is a little ledge of rock with soundings of 4 fathoms at 2 cables from it. The town of Kauit is situated on the tongue of sand; it contains about 500 persons, and is defended by a fort.

Anchorage.—Between the towns of Kauit and of Pagalad to the N.W. there is anchorage in 6 fathoms, sand, sheltered from N.E. winds.

Prueba bank begins one mile south of point Kauit, and extends 2 miles to the south; it is one mile wide at the northern end, whereon is the least water, half a fathom; the depth increases in the middle of the bank from 4½ fathoms on the east side, to 10 fathoms on the west; around its edge the depth is 11 to 16 fathoms; and in the channel between it and point Kauit, 20 to 25 fathoms.

Cresta de Gallo, (Cock's Comb) islet and reef.—The islet is 6⅓ miles S.W. of point Kauit; it is low, with a beach of sand, and covered with trees. It shows several peaks along the length of its outline, of three-quarters of a mile, which give it its name; from its North points, a ledge of sand and rock which sometimes uncovers projects to half a mile.

The reef that surrounds the islet extends one mile to the North, and 3 to the South; and its width abreast of the islet is half a mile to the East, and one mile to the West. The depth on the northern edge is 3¼ fathoms, and on the southern 5½ fathoms, sand and stones, falling abruptly to more than 50 fathoms at a little distance.

The channel between Cresta de Gallo, and Prueba banks is 3½ miles wide, and clear of dangers.

Romero shoal, a patch 2½ to 4½ fathoms, sand and stones, of 6 cables extent, lies 2 miles S.E. of Cresta de Gallo. The channel between them is over 110 fathoms deep.

The other shoals between Sibuyan island and Masbate are described further on.

East Coast of Sibuyan.—From Point Kauit, the coast to the northward and eastward for 7 miles to point Kajidiokan is sandy and clear, with soundings of 45 fathoms generally at a distance of half a mile.

Point Kajidiokan is a salient point of sand in low land. The town of Kajidiokan is situated in a picturesque valley between the hills. Its population is 6,500, given to agriculture and fishing. Cattle are cheap and plentiful, and water can be had from the river.

Anchorage.—There is anchorage before the town for vessels of all sizes during the S.W. monsoon.

Point Kambulayan, the eastern point of the island, is steep with a flat crown of inconsiderable height; rocky and wooded; the soundings off it are 4 fathoms at a distance of 2 cables, and, as on all the S.E. part of the coast, no bottom with 110 fathoms at less than a mile. The river Kambulayan, immediately to the southward of the point, has half a fathom on the bar, and deeper water inside, where there are fine tracts of level ground cultivated by the natives who who live on the margins.

N.E. reef of Sibuyan is a dangerous reef of sand and rock, which extends from point Kambulayan to point Kanloai, 7 miles to the N.W. It is separated from the coast by a channel half a mile wide and 12 to 27 fathoms deep; the coast is covered by mangroves, and fringed by rocks.

The reef is half a mile wide, the depth on its ends is 2½ to 5 fathoms, and in the middle of it three-quarters of a fathom, with many rocks that uncover at low water; the soundings near its outer edge are 65 fathoms, and off its northern end 40 fathoms. In the middle is a gap, leading to the bay of Lubug.

Point Kanloai is low, covered with mangroves, and surrounded by a reef which extends out half a mile, and has 6½ fathoms on its northern edge.

Off point Kansumalak, 5 miles to the westward, the coast reef extends out one mile, with depths of 4½ to 9 fathoms on its northern edge.

Shoals.—A rocky shoal of 4 cables extent lies N. 26° W. 1⅔ miles from point Kansumalak; 6 fathoms was found near it to the N.E. by the gunboat *Prueba* in 1867, but the state of the sea did not allow her to examine it. A short distance S.W. of this shoal and at 1⅓ miles W.N.W. of point Kansumalak, is another shoal of 2 cables extent, covered by half a fathom water. The depth between the shoal is 20 fathoms; between the southernmost and the town of Magallanes, 12 fathoms; and one mile to the northward, no bottom with 110 fathoms.

Magallanes bay and town.—The bay is small and open, between points Kansumalak and Kangouak. The river Nailog flows into it, and on its left bank lies the town of Magallanes, of 11,000 inhabitants: on the bar of the river there is generally a depth of feet, and within it of 8 feet. During the S.W. monsoon freshets from the river shift the bar, and increase the depth.

Anchorage can be had in 2½ to 9 fathoms in the corner formed by point Kangouak; care being taken to avoid a rocky ledge that projects from it to the eastward.

Coast.—From point Kangouak to point Kabodianga, the coast is steep-to, with soundings of 12 fathoms near the shore. Point Ipil is remarkable by a little flat crown of red earth; it is of moderate height.

The entire coast of Sibuyan can be approached to a distance of one mile from it, except on the northern and N.E. parts, which must be kept at 3 miles distance.

CHANNEL BETWEEN SIBUYAN and MASBATE.—This channel, which is about 30 miles wide, was explored in 1865 and 1867 by the Spanish surveying gunboat *Prueba.* It contains several dangers, which are all charted, and which are situated on two lines stretching about N.E. and S.W.; they are all surrounded by deep water, and the lead gives no warning of their vicinity; but in daytime they can generally be seen 2 miles off.

The western line of these shoals is about 6 miles from the coast of Sibuyan, and contains the following:—

Cervera, the northernmost, is of 2 miles extent, covered by 1¾ fathoms least water, and with 7 fathoms on the rest of it. From it the S.E. peak of Sibuyan bore S. 87° W., and Cresta de Gallo S. 34° W. One mile east of it is a bank 4 cables long N. and S., and very narrow, with a sand bank on its centre, 5 feet above water, and deep all round. This dry bank lies S. 79° W. of the Vantay of Kajidiokan.

Perseus is half a mile in extent, and has on it a rock covered by 3 feet least water. From it the S.E. peak of Sibuyan bore N. 73° W., and Cresta de Gallo S. 44° W.

Roda, not named on the chart, is of 6 cables extent, and has 2¾ fathoms, rock, on its shallowest part. From it point Kauit bore N. 85° W., and Cresta de Gallo S. 45° W., distant 5½ miles.

Aubarede, not named on the chart, is small, and has 4½ fathoms, sand and rock, on its shallowest part. From it point Kauit bore N. 63° W., and Cresta de Gallo S. 30° W., distant 2½ miles.

Cresta de Gallo has been described, p. 221.

On the eastern line of shoals are the following .—

Bennet bank is of one mile extent, and has on its centre a narrow bank of sand 10 feet above the sea, a cable long, with some vegetation on it. From its centre, Gato island bore N. 73° E., and Kamasusu S. 32° E.; both these islands are on the coast of Masbate.

Montero, not named on chart, 7 miles S. 25° W. of Bennet bank, is of 3 cables extent, and has a rock on it covered by 3 feet water. From it Gato island bore N. 47° E., and Kamasusu, S. 57° E.

LAS LLAGAS.—Pineda is of half a cable extent, and has 1¾ fathoms, least depth, on it. From it Gato island bore N. 46° E., and Kamasusu S. 78° E.

Arana, 2 miles to the S.W. of the last, is a dangerous rock of half a mile extent, with 3 feet, least water, on it. From it Kamasusu bore S. 88° E., and Mount Sibuyan N. 57° W.

Reynoso. — The southernmost, of half a mile extent, and 3¾ fathoms, least depth, is half way between point Kauit and the island Gintolo, and 18½ miles from Masbate. From it Kamasusu bore S. 88° E., and Mount Sibuyan N. 57° W.

Roldan, 4 miles W.N.W. of Pineda, is of half a mile extent, covered by three-quarters of a fathom. From it Cresta de Gallo bore S. 74° W., and Mount Sibuyan N. 61° W., and Kamasusu S. 77° E.

Carrasco, 2 miles south of Roldan, is of half a mile extent, and 2¾ fathoms least depth; from it Cresta de Gallo bore S. 84° W., and Kamasusu S. 78° E.

These five shoals are included in a dotted line in the chart under the head of Las Llagas.

Directions.—To clear this channel, a vessel should pass either between Sibuyan and the western line of shoals, or between Masbate and the eastern line. Both routes are easy and direct, even at night, when the land can be seen; but a good look out should be kept from aloft.

From the northward.—The N.E. reef of Sibuyan should be kept at 3 miles distance; and from a position 2 miles east of Kambalayan point a S.S.W. course will lead between Prueba bank and Cresta de Gallo islet; and when that little islet bears N.E. ½ N., distant 5 miles, a course can be steered between Jintotolo island and the Zapatas.

If the channel near the coast of Masbate be taken.—When the island Gato bears east 3 miles, a S. by W. course for the island Zapata Mayor will lead clear of all dangers, until Jintotolo island bears east 4 miles.

From the southward these directions should be reversed.

Currents are not strong in the channel; the flood-tide, coming from the north, meets in mid-channel that coming from the south, and they counteract each other.

WEST COAST of MASBATE.—**Point Bugui,** the northern point of Masbate, is very high, rugged, and steep-to, and can be passed close to in 7 or 8 fathoms. From it to point Bagupantao, 9 miles to the southward; the coast is high, and the soundings off it, at one mile distance, are from 1½ to 5½ fathoms, while a little farther out 10 to 15 fathoms. There is anchorage for coasters in a little bay S.E. of point Bagupantao, in 4½ fathoms.

Gato island, 2⅔ miles W.S.W. of point Bagupantao, is clear and steep-to; between it and Majaba island on the coast the depth is 12 fathoms, and in the middle of the channel between it and Bennet bank, 34 fathoms.

Coast.—From point Bagupantao to point Mariveles, 14½ miles to the southward the coast is somewhat lower, and forms bays of no importance, and of little depth of water, fronted by the islets Majaba, Nabuglut, Bagunbanua and Napayauan. In the northern end of this bay, S.E. of point Bagupantao, there is shelter for coasters in 4½ fathoms.

Soundings.—Near these islands, on the outside, the depth is 6 fathoms, which increases to 15 to 25 fathoms, at 2½ miles distance.

Tumalaitai island, one mile west of the point of the same name, is small and wooded, and connected with the land by a strip of sand; the depth at half a mile outside it is 16 fathoms. Between this islet and Napayaun, 3 miles to the northward, a ledge of sand projects from the coast, but does not extend beyond the line of islands; there are 3 fathoms on its outer edge.

Shoal.—2¼ miles W.N.W. of point Mariveles is a small shoal of coral, covered by 4½ fathoms, and surrounded by 7 to 10 fathoms, From its centre Gato island bore N. 9° E., and Kamasusu island peak S. 44° E. Between the shoal and the coast the depth is 15 fathoms.

See Span
chart No. 6
on which the
shoal is
shown.

NIN BAY,* is divided into two parts by the islets Kamasusu and Karogo; the North part, on Nin bay proper, is safe and well sheltered, with good holding ground; the entry presents no difficulty; the shores are steep, and the depth in the centre is about 7 fathoms. A little channel of 2½ fathoms leads to the small interior port, Alag, where a vessel can anchor in 1½ to 4½ fathoms, mud, before the entrance, as in a basin.

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* *See* Admiralty plan, Ports in the Philippines. No. 962, scale, $m = 1{\cdot}63$ inches.

The little town of Mandao is situated on the narrow peninsula that separates Nin bay from the inner port Alag; it has few inhabitants and no resources.

Water can be obtained from a rivulet on the North shore.

The southern bay, Makaguayak, has at the middle of its entrance a shoal, not shown on the plan, covered by three-quarters of a fathom, which reduces the width of the channel that passes south of the reef of Kamasusu to little more than half a mile.

The islets Kamasusu and Karogo are safe; they are separated by a channel one cable wide, and 6½ fathoms deep.

The Coast, from Nin bay to point Jintotolo, 12½ miles S.S.W., is high and safe, with soundings of 3½ to 7 fathoms at the distance of half a mile.

Point Jintotolo is low and wooded, 2 miles S.E. by S. of it is point Pulanduta; both points are clear with soundings of 4½ to 7 fathoms at a very short distance.

Anchorage.—To the eastward of point Pulanduta there is anchorage in 5½ fathoms, sand, but care must be taken to avoid a patch of 5½ fathoms that lies N. 76° E. of the point at one mile from the coast.

JINTOTOLO ISLAND, 2¾ miles S.S.W. of point Pulanduta, is 2 miles long north and south, and 1⅔ miles wide; it is 120 feet high, well wooded, with a beach of sand. It is surrounded by a reef which extends 4 cables on its east and west sides, with 2½ fathoms on the eastern edge, and 4½ on the western. The channel that separates it from point Pulanduta is clear, with 14 fathoms in the middle.

Circe bank, 7 miles E. by S. of point Pulanduta, has 3¼ fathoms on it; it is of 6 cables extent, north and south, and is steep on its southern side. From it Zapata Mayor bore S. 22° W., and point Pulanduta N. 71° W.

SOUTH COAST of MASBATE.—Asid gulf, which forms the south coast of Masbate, is included between points Pulanduta to the west and Buri, 33 miles to the east, and is 17 miles deep to the northward. The western shore is clear; but the eastern part is filled by islets and shoals.

Naguran islet, in the centre of the northern part of the gulf, is small, and surrounded by a narrow reef. At one mile south, and at 2 and at 5½ miles south-west of it, are shoals that uncover in parts, with 2½ fathoms on their edges, and 7 to 8 fathoms between them, and between them and the coast.

From Naguran islet there extends to the S.E. a chain of islets and shoals, which range the coast at a distance of 3 to 4 miles from it. The shoals extend to a distance of 12 miles from the neighbourhood of point Buri, towards the banks north-east of the Gigantes group. It is probable that there are yet other reefs besides those marked on the chart; it would therefore be prudent to exercise the greatest care in navigating this sea, and to keep a good lookout from aloft.

Guinlubugan and **Gilutugan islets** are both situated on circular reefs of $1\frac{1}{2}$ miles diameter; between them are three smaller islets, with rocks about them; the depth of water between the islets is 3 to $5\frac{1}{2}$ fathoms, and between them and the coast, 7 fathoms. Two miles N.N.W. of Guinlubugan there is a group of rocks; and N.E. by N. of it, off point Palabao, is a small shoal; another shoal of sand and rocks of $1\frac{1}{2}$ miles extent, and covered by $3\frac{3}{4}$ fathoms water, lies $3\frac{1}{2}$ miles south-west of Gilutugan. 2

Little Naro is of one mile extent, and is surrounded by a reef which extends to the distance of one mile. The islets Pobre and Guinlubugan, to the north and north-west of it, are surrounded by rocks. South-west of it is a shoal of 2 miles extent, east and west; the least depth over it is three-quarters of a fathom; on its southern part there are 3 to 5 fathoms.

Naro island is 2 miles in extent; of regular height, and surrounded by a reef which advances half a mile to the north and one mile to the south, terminating to south-west in a shoal of $2\frac{3}{4}$ fathoms, the outer limit of which, in 7 fathoms, is 3 miles from the island. A shoal of $1\frac{1}{2}$ miles extent N.N.E. and S.S.W., with three-quarters of a fathom on it, and 7 fathoms around it, lies 5 miles S.W. by S. of the south point of Naro. At 3 miles south-east of the same point is the north-west head of a sand bank, which extends 5 miles to the south-east; it is 2 miles wide, and the least depth on it is $2\frac{3}{4}$ fathoms, on the eastern side. From the south end of this bank point Kaduran bears S. 82° E., and Mount Vigia, north. At one mile west of the south-eastern end of the bank is a patch of $2\frac{3}{4}$ fathoms, with 5 to 11 fathoms around it.

Nabutug and **Naguno**, like all the other islets, are surrounded by reefs; from the latter a tongue of sand projects 2 miles to the south, with $1\frac{3}{4}$ to $3\frac{3}{4}$ on it, and $5\frac{1}{2}$ fathoms off the southern end.

Guinauayan islet sends out a reef from its east side to the distance of 2 miles, with a width of half a mile.

Coast.—Mount Vigia, on the Masbate coast, north-east of Naro island, is a remarkable high hill, the rounded base of which is called point Buri; this point is surrounded by rocks which, continuing to the north-westward, form a reef covered by 2¾ fathoms water, reaching as far as point Palabao (Pacao), a distance of 11 miles; this reef, extending off the coast to 3½ miles, entirely surrounds Pine island. From mount Vigia to point Kaduruan, 23½ miles S.E. by E., the coast is clear, except at point Nauko, which is surrounded by a reef; the soundings off it are 3¾ to 6 fathoms.

The towns of Guion, north of mount Vigia, and of Darago, north of point Nauko, are of no importance.

Point Kaduruan, the south-east extremity of Masbate island, is long and sharp; from it a ledge of sand, one mile wide, projects to the distance of 3 miles to the southward; the depth on it is said to be 3 to 4 fathoms; no soundings have been taken around its end.

ISLANDS SOUTH of MASBATE.—Manok-Manok isles consist of three pointed rocks situated on a shoal, 8½ miles south of point Kaduruan; no soundings have been taken in their vicinity.

Karnasa island, 4 miles S.E. by S. of Manok-Manok, is a flat island, 1⅔ miles long and half a mile wide, with three pointed rocks at the distance of one mile from its south-east part.

Gato islet lies 10 miles north of the nearest part of Sebu island; it is small, but high (150 feet), pyramidal in shape, and steep-to; with 19 fathoms close to it, and 12 fathoms, coral, midway between it and the island Malapascua, 8 miles south-east of it.

Tanguingui islet, situated 22½ miles E.S.E. of North Gigante, is 40 feet high, flat, wooded, and surrounded by a sand beach; the water is shoal in its vicinity, and at half a mile from its S.W. part the depth is 4½ fathoms.

Shoals.—A rock, reported in 1880, covered by 3 fathoms water, position doubtful, is placed on the chart 3 miles west of Tanguingui; from this rock the peak of Maripipi is just open south of point Kaduruan. A bank of coral, covered by 3 fathoms water, lies midway between Tanguingui and the north coast of Bantayan; it is 2 miles long N.W. and S.E., and one mile wide.

NORTH and EAST COASTS of PANAY ISLAND.—Point Potol (described p. 210) is flat and sandy, with a few trees on it; to the east of the point, at less than a mile distance, are seven rocky islets; small craft can pass between them and the coast at high water.

Coast.—From point Potol, the general trend of the coast is approximately E.S.E. for 73 miles to point Bulakau, the N.E. point of the island Panay ; the shore is for the most part sandy, and the coast in its neighbourhood low.

Point Sabonkogon, 3½ miles east of point Potol, with which it forms a small bay, is high and clear, and can be approached to within a short distance ; from it to point Ibahai, 11½ miles S. 62° E., the shore is clear and steep.

Point Ibahai is sandy and flat ; on it is the town of the same name ; N.E. of the town there is good anchorage, sheltered from southerly winds ; but as during the S.W. monsoon the wind often veers suddenly to N.W., and Pontud bank would then be to leeward, a large vessel could not remain here with safety.

Points Sigat, 2½ miles E. by S. of point Ibahai, and **Agpa** 2½ miles farther on, are both high and surrounded by reefs—a cable wide, with 8 fathoms at the edge. Between them is a little bay, open to the north, and fronted by Pontud bank ; the soundings in it range 11 fathoms, coarse sand, between the points, to 2 fathoms, sand, near the beach at the end.

Pontud bank.—The S.E. extremity of this bank is a mile and a half N. by E. of point Agpa ; it extends 2½ miles to the N.W. with a width of one mile. It has three heads ; the centre one is the shallowest, having half a fathom, sand and stones on it ; that to the S.E. has 1¾ fathoms coral, and that to the N.W. 3¼ fathoms, sand and stones. The northern part of the shoal bears N.E. 3 miles from point Sigat, and has 8 to 23 fathoms at its edge, and no bottom with 100 fathoms line at the distance of 2 miles. The channel between the bank and the coast, is good and deep.

Akdan point and river are 7½ miles S.E. of point Agpa. The point, which is flat is formed by deposits from the river which flows out to the west of it. On the bar there is ordinarily five feet water, and with fresh N.E. breezes the sea breaks heavily on it.

Port Batan* 10 miles S.E. of Akdan bar is a deep bay surrounded by low land cut into by several creeks. The entrance is open to the N.N.E. and can easily be recognised by Okbok hill, an insulated cliff with a flat top, situated 2 miles to the east of it, in low land near the beach. On each of the points that form the entrance there is a vantay, and both points send out banks, the one from the east point extends a mile and a half N.N.E. and has three-quarters of a fathom on it, and 2 fathoms at the end ; the one from the west point extends half a mile to the north and has one fathom on it.

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* *See* Admiralty plan ; Ports in the Philippines, No. 944 ; scale, *m* = 1·5 inches.

Between these two banks is a channel 3 cables wide and 6 fathoms deep, running approximately N. 17° E. and S. 17° W. that leads to the interior of the port which is completely sheltered from wind and sea. The bar fronting this channel has ordinarily 3 fathoms on it; but it is liable, as well as the banks from the entrance points, to shift with the freshets. There are no other dangers than these banks; they are not marked by stakes, but are indicated by the colour of the water over them.

Anchorage.—The best anchorage inside is in $5\frac{1}{2}$ fathoms, mud, before the town of Batan, of 8,400 inhabitants.

Sapian bay is 3 miles wide, and the same in depth; it is safe, with 4 fathoms at the entrance, and 3 fathoms in the centre of the bay. It is sheltered from all winds but those from the northward.

Mobai and Tuat are small rocky islets, with trees upon them. Mobai is clean, with soundings of three fathoms off it; but Tuat has rocks on its northern and southern sides. Between these islets and the point south of them the depth is $4\frac{1}{2}$ fathoms; but the point is fringed with rocky islets and shoals of 2 fathoms.

Point Nipa (Kolasi) is high and very steep; there are two flat rocks three-quarters of a mile north of it; the northern one covers only at very high tides; between the two the depth is 3 to 4 fathoms, and between the south one and the point 3 fathoms; outside the rocks there are $5\frac{1}{2}$ to 7 fathoms.

Kapis roads, open to the N.W., offers an anchorage in 6 fathoms, sheltered from the N.E. between the bar of the river Kapis and point Nipa.

River Kapis, or **Panay**, one of the most important in the island of Panay, is protected by a bar of sand, on which there are 4 or 5 feet at low water, and sometimes as much as 13 feet at high water. Within the bar the depth increases to 3 fathoms, and continues that depth for 3 miles, as far as the town of Kapis, which has a population of 23,000, and carries on a brisk native trade, principally in export of rice. Steamers from Manila call weekly.

Olutaya island is one mile in length, N.E. and S.W., and very narrow; two rocks above water lie off its N.E. part, and another off its S.W. end. The coast of the island forms little bays in which coasters find anchorage in 3 to 4 fathoms. Around the island there is 7 fathoms water, but the passage between it and the main is blocked.

Between Olutaya island and Bulakau point there is a great bay, with no good anchorage in it.

Kasamayan bank, 3 miles N.W. of the town Sanayon, on the south-eastern shore of the bay, is three-quarters of a mile long, west and east, and half a mile wide; it consists of sand and rock; the middle part uncovers at very low tides, the remainder has less than 6 feet water over it. From the centre Sharp peak bears S. ½ W., and Olutaya island W.N.W.

Bulakau point, the N.E. extremity of Panay island is a spur from the mountains Sibala and Sharp peak; the point is low, and terminates in a sand spit with rocks at the end, which extend out rather less than a third of a mile, and uncovers at low water.

Tidal streams.—In the sea north of Panay, sometimes called the sea of Kapis, the flood stream enters from the westward by the passages between Panay, Karabao and Tablas, and also by the passages between Tablas Romblon and Sibuayan.

This last stream passes along the S.W. coast of Sibuyan and between Kauit point and Cresta de Gallo, with great force, but on the east coast of Sibuyan it meets the flood stream from the eastward by the strait of San Bernardino, and loses all its force.

The ebb stream moves in the reverse direction, and by the same passages, and is not felt on the S.W. coast of Sibuyan.

The strength of the stream at full and change of moon is 3½ miles an hour between Panay and Tablas, and 2 miles an hour between Tablas and Sibuyan.

JINTOTOLO CHANNEL is the name given to the passage between the S.W. point of Masbate, and the N.E. point of Panay; Jintololo island, already described, and the Zapatos, three islets on a bank lying 6 miles S.W. of Jintotolo island, divide the channel into three passages; that between Jintotolo island and the Zapatos is generally used.

Zapato Mayor is 260 feet high, wooded and cultivated; a shoal extends one mile to the westward from the island; and has 3½ fathoms water over it, and 5½ to 7 fathoms at the edge.

Zapato Menor is 270 feet high, bare, and clean on all sides except the western, from which there projects a narrow ledge.

The little islet Chinela, between the two Zapatos, is surrounded by a reef 3 to 4 cables wide. The depth of water on the bank and between the islets is 5½ to 8 fathoms.

Elcano shoal.—In August 1865 the Spanish gun vessel *Elcano* struck soundings on a bank of sand and rock, 13 to 5½ fathoms. From the position in 5½ fathoms Zapato Mayor bore S. 33° E., Pulanduta point N. 85° E., and Kamasusu island N. 43° E.; the extent of the bank was estimated at 3 miles W.N.W. and E.S.E.

This bank is not shown on the Spanish chart corrected to 1873, but its position is close to the eastward of a sounding of 10 fathoms, obtained by H.M.S. *Nassau* in 1871. It lies close to one of the most frequented routes of the Archipelago; but as yet no other notice of any danger has been reported.

Cucaracha shoal, 6 miles N. 30° E. of Bulakau point, and 11 miles S. 79° E. of Zapato Mayor, is a small circular bank, 1½ miles in diameter, covered by 2¼ fathoms, with one rock nearly awash on its northern part. Off the northern edge of the shoal the depth is 4 fathoms, and off the southern edge 6 fathoms.

ISLANDS OFF THE EAST COAST OF PANAY.

Manigonigo, 1¾ miles N. 10° E. of point Bulakau is a conical islet small and sandy, 90 feet high, surrounded by rocks to the distance of one cable on all sides but the south, where they extend to two cables. The channel between the islet and the point, has a depth of 2¾ to 4 fathoms, and is only fit for small craft; the greater depth is near the islet.

Danger.—A dangerous rock covered by 1¾ fathoms water, with 2½ fathoms beside it, lies one mile S. 26° W. of Manigonigo, and less than 1½ miles from the coast.

Currents.—The tidal streams are strong here, the flood tide sets to the east, and the ebb to the west.

Lulugban or **Nabun~~a~~ut**, 3½ miles ~~W~~e. by S. of point Bulakau, is one mile in extent and 100 feet high; it is surrounded by rocks which extend 4 cables from it to the S.W. A patch of 2 fathoms lies 1¼ miles S.W. of the isle.

Tulunanaun, 1¾ miles S.W. of Lulugban, has a hill 200 feet high; on its northern part it is 1⅕ miles long N.E. and S.W., and is surrounded by rocks to the distance of 2 cables, with soundings of 2½ to 4 fathoms at the edge; on its N.W. coast are three steep rocks. The channel which separates it from Lulughan has 2½ to 4 fathoms water. At one mile S.E. of Tulunanaun is a patch of 3½ fathoms, surrounded by 6½ to 7½ fathoms.

Balbagan is about a mile long N. and S., narrow, and about 100 feet high, with a little sand hill on its S.E. extremity. It is surrounded by rocks, and by a shoal which extends from it 8 cables to the north, a mile to the north-east, and two miles to the south, where on the end of the shoal there is 3½ fathoms water and 5½ off it.

The west coast of the isle is clear at 2 cables from it. At 1½ miles S. 75° E. of Balbagan, between it and South Gigante are rocks awash at low water, and at the northern entrance of the channel, between it and North Gigante, a patch of 5½ fathoms.

The channel between Balbagan and Tulunanaun, with the exception of the rock above mentioned, S. 45° E. of Balbagan, is clear, with 7 to 16 fathoms depths, but midway betwen Balbagan and Lulugban, is a patch of 2¾ fathoms, and the soundings on the western side of this channel are irregular from 3½ to 6 fathoms.* Vessels of large draught will do well to take the passage north of the Gigantes, rather than that between Balbagan and Tulunanaun islets.

GIGANTES ISLANDS, or Sibuluak, are a group of two islands of moderate height, together with several islets, and sharp, detached, rocks. The group is clear on its northern side, and the shoals on the other sides do not project more than three-quarters of a mile.

North Gigante, or **Sibuluak Babai** is 2 miles long North and South, and one mile wide, with a wooded hill on either extremity; it is surrounded by a shoal which extends to half a mile to the east and west of it. At 7 cables to the east of the N.E. extremity lies the islet Uaidajan, clear and steep, with 5½ to 9 fathoms between it and North Gigante. On the S.E. edge of the bank there are three detached rocks, with no channel between them and the island.

South Gigante, or Sibuluak Lalaki, half a mile south of the northern island, is of irregular form, about 2 miles long from east to west, and half a mile wide on the western side, which is the highest. On its northern side is a reef which dries, and forms, with the reef of the northern island, a channel with 1½ fathoms at the eastern end, and 6 fathoms at the western; the other sides are clear. At 8 cables S.E. of South Gigantes are three small islets; the southernmost, named Antonia, is clear on the outsides. Between these islets and South Gigantes there is a channel of 6 to 8 fathoms depth.

Anchorage.—In the N.E. monsoon vessels of all sizes can anchor off the S.W. coast of South Gigante in 7 fathoms, mud and sand. In the S.W. monsoon very small vessels can anchor in the channel between the islands.

Bank.—About 5 miles N. 61° E. of the N.E. point of North Gigante, is the shallowest part (3¼ fathoms) of a bank, which extends approximately 9 miles E.S.E and W.N.W., with a mean width of 3½ miles. The depth on it is irregular, from 3¼ to 9 fathoms. The bank is included between the bearings N.E. by N. and E. ½ N., from the N.E. point of North Gigante. The channel between the shallow part of the bank and North Gigante, is the most open and direct for going through Jintotolo channel.

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* N. O. of H.M.S. *Serpent*, 1868, remarks: "Care must be taken to avoid a shoal of 2 fathoms S.W. of Balbagan." This is not shown on the chart.

Isolated Shoals.—Within a radius of 12 miles from N.W. by W. to S.E. by E. of North Gigante, there are a certain number of isolated patches, covered by 4 to 7 fathoms water. The northernmost of these, of 4 fathoms, has not been examined; and the position of another, of 6 fathoms, near the edge of the last described bank, is doubtful.

Coast.—From point Bulakau. the coast trends S.S.E. for 2½ miles up to a bluff, Kamboloton, and thence forms a wide but shallow bay, fronted by the island Balin, and terminated by point Kago, 4½ miles south of the bluff. This bay, which is named Bankul, has only 1½ fathoms depth at high water, and at low water several sand banks appear, which block the passage to the three rivers that fall into it.

Gogo

Balin or **Binuluangan island** is 3½ miles long, low and of irregular shape, it has a surrounding reef with several rocky islets on it; the channel between the south point of Balin and point Kago is 1½ fathoms deep.

Kalagnan island is separated from Balin by a channel 7 cables wide at the N.E. end, but almost closed at the S.W: it is 3½ miles long N.E. and S.W., and 3 miles wide, and of regular height. The east coast is clear and steep, but the N.E. point has several rocks around it; the western side contains several bays of no importance, because of the little depth of water in them. 3½ miles east of the north point of the island there is a patch of 6 fathoms, surrounded by 14 to 17 fathoms.

Cañas is a little island off the east coast of Kalagnan; it is half a mile long, east and west, of middling height, and clean, with 7 to 11 fathoms at one cable from its east side, and 2¾ to 3¾ at the same distance from its west side. The soundings in the channel between it and Kalagnan are 7 to 11 fathoms, and in the channel between it and the N.W. point of Sikogon, 11 fathoms.

Sikogon, 6 cables S.E. of Kalagnan, is high and of 2½ miles length N.E. and S.W. The N.E. part has a reef of 2 cables width on which is a little islet, steep on the outside; this reef fringes the island on its northern and western sides; the east coast is clean and steep; at 2⅓ miles east of the little islet on the north side is a patch of 4¾ fathoms, surrounded by 9 to 20 fathoms.

Carmencita shoal is small, of sand and rock, with 5 feet less water on it, and 4 to 6 fathoms at the edges. It bears S. 42° E. one mile from the east point of Cañas, and is 9 cables from the north coast of Sikogon.

Sikogon channel, between Sikogon and Kalagnan, is half a mile wide, and 7 to 12 fathoms deep; it is clear and safe, and is the channel recommended for vessels making for Iloilo strait.

Coast.—South of point Kago the coast forms a little shoal bay, and then the anchorage of Estancia, of 2½ to 5½ fathoms, between the little isle Luginut (S.W. of Kalagnan) and the Bayas isles. The town of Estancia is a mile inland, and there is a good road to it from the coast. From there the coast is foul, and should be avoided till off the island Ragalumbi, which is high; it then forms two bays, clear and deep, giving fair shelter and anchorage in westerly winds to the strait between Tagil island and the coast of Panay.

Bayas isles are a group of four islets of little height, near the coast, 3⅔ miles S.E. of point Kago. They extend 1⅔ miles from east to west and are surrounded by sand banks, and rocks, with no passages between them. At one mile west of the south point of the largest isle, is a shoal, awash at low water, and between Bayas and the island to the northward, Luginut, is another patch of half a fathom.

Anchorage.—Small craft can find anchorage, sheltered from all winds, between Bayas and Luginut, in 2½ to 6 fathoms. H.M.S. *Nassau* anchored in December 1871 in 13 fathoms, mud, with Culebra island S. by E. ½ E., and the right tangent of Sikogon E. ½ S., the weather being thick and dirty, and night coming on.

Culebra.—Midway between Sikogon and Pan de Azucar, is a small island about 200 feet high, and surrounded by a reef of sand and rock, which extends 6 cables to the westward, with 1½ fathoms at its extreme western edge, and 11 fathoms at a short distance from the island and from the reef.

Shoals.—There are three shoals northward and eastward of Culebra. The northernmost is 2½ miles N. 42° E. of Culebra, of one mile extent, and 2 fathoms least water on its east side, and 3¾ to 6 fathoms on the rest of the shoal. The easternmost is 4 miles E.N.E. of Culebra, and has 1¾ fathoms water over it, and the southernmost is 2½ miles E. by N. of Culebra with 1½ least water. These three shoals all have 8 to 20 fathoms around them, which are the general soundings off the N.E. coast of Panay. Nearly 5½ miles S.E. of Culebra, and at the same distance to the east of Pan de Azucar, there are two patches of 2¾ and 3¾ fathoms, surrounded by 14 and 15 fathoms.

Pan de Azucar (sugar loaf) is near the coast of Panay, and is the largest of a group of five islands at the northern entrance of Iloilo strait. Its base is 4 miles in extent, and it has two remarkable peaks; the highest is 2,037 feet. The north coast sends out a reef to the northward, which terminates in a rock at half a mile from the island. The east coast is clear. Between this island and Tagil, to the S.W., is a narrow channel of one to one and a half fathoms Bagaisi, one mile north of Pan de Azucar is clear and deep in its surroundings.

Naburut, 4 cables off the N.W. coast of Pan de Azucar is clean.

Buglug on the S.E. coast of Pan de Azucar is united to that island by a stretch of land, it is clear and steep on the east side.

Midway between Pan de Azucar and the coast of Panay is a small shoal, of one cable extent, awash at low-water, there are 2½ fathoms between it and Pan de Azucar, and 1½ fathoms between it and Tagul.

Malangaban, 1½ miles S.E. of Pan de Azucar, is nearly round; high, clear, and deep off its western part. The little islet close to its S.W. part is also clear. The channel between Malangaban and Pan de Azucar is 1½ miles wide, and 9 to 12 fathoms deep. Danao, between Malangaban and Bulubadiangan, is small and surrounded by a reef; the channel between it and Bulubadiangan has 3¼ to 4 fathoms.

Bulubadiangan, 2 miles S.S.E. of the south point of Pan de Azucar, is of triangular shape, of middling height, clear, and deep; off its south point are two islets joined to the point by a reef.

Baliguian, 9 miles East of Bulubadiangan, is a small islet, 150 feet high surrounded by a narrow reef very steep-to, round which there are 15 to 20 fathoms. This islet is a good natural mark for vessels making Iloilo strait from the northward and from the eastward, to clear the numerous shoals about the route.

Shoals.—The three nearest shoals are—one of 2½ fathoms, lying South 1½ miles of Baliguian; another of 2¾ fathoms, lying N.E. 3½ miles; and another of 3¾ fathoms, N.N.E. ¼ E. 4½ miles from Baliguian. The French charts show another shoal 4 miles north of Baliguian.*

A written description of all the other shoals which encumber the channel North of Negros island, between the N.E. part of Panay and the island Bantayan, would be needless; they can best be understood from the chart.

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* Instructions sur le Grand Archipel d'Asie, p. 381.

Tagil island, between Pan de Azucar and the headland of Bakahuan, is 3½ miles in length from N. to S. and of moderate height. The eastern shore is clear and steep, with the exception of a small shoal that projects from the middle of it. The western shore and the south point send out reefs, and off the S.W. point is a rocky shoal, awash at low water. The passages which these reefs and shoal form with the coast of Panay, have a depth of 1½ to 2½ fathoms.

Sombrero, half a mile N.W. of the N.W. point of Bulubadiangan, is round, high, clean and steep-to. At its S.E. part there is anchorage in 9 fathoms, mud, sheltered from S.W. winds. The channels between it and Pan de Azucar, and Bulubadiangan are safe ; in the last the depth is 6½ fathoms.

Bagabu is very near the south point of Tagil ; on its south part a point of sand and rocks projects to a very short distance. The channel between this islet and Bulubadiangan is 1½ miles wide and 7 fathoms deep.

a **T~~u~~gubanhan** is a little more than a mile S.E. of Bakahan headland on the coast of Panay, with which it forms the strait named Apiton. It is 4 miles long N.N.E. and S.S.W., and 2 miles wide ; high, clear and steep-to.

Apiton strait is the southern termination of the inner route to Iloilo strait from the northward ; it is clear, with a depth of 9 to 11 fathoms, and the coasts on either side are steep.*

Anajuayan, 2 miles S.E. of Tugubanhan, is 336 feet high, and visible from a ship's deck 15 miles off. Between it and Tugubanhan the depth is 12 fathoms.

Turia rock is a dangerous rock 4 miles S. 44° W. of Anajuayan, it is about 100 feet in extent with 5¼ feet water on it, and 8 fathoms close to. From a position in 4½ fathoms, 220 feet north of the rock the following bearings were taken. Tangent of S.E. part of Anajuayan, N. 47° E. North part of Calabazas islands N. 63° W.

Anchorages.—The *Challenger* in October 1874 anchored for the night North of Anajuayan in 10 fathoms with the right tangent of Tugubanhan bearing North, and the left tangent S. 53° W. There is also anchorage off the N.W. side of Tugubanhan, and off Bakahan bluff.

S.E. COAST.—The north side of Apiton strait is formed by a rocky headland (Bakahan bluff) high, clear, and steep-to, with a little islet joined to its south part. On the south side of the bluff is Abra de Apiton, a creek with an entrance channel one fathom deep, close to the north shore and between that shore and a bank in the mouth of the creek. Inside there is a depth of 3 fathoms, and anchorage for small craft near some rocks off the beach.

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* *See* Admir cha , Sulu or Mindoro Sea, No. 2,578 ; scale, $m = 0{\cdot}1$ of an inch.

Water.—There is a watering place on the north shore near the first beach at the entrance, water can also be obtained on the south side, but not so good.

West of Abra de Apiton the coast forms a bay, Ajui, 3½ miles wide, in which there is shelter from N.E. winds. The river Ajui, leading to the town of the same name, enters on the north shore, it has a depth of 1 to 1½ fathoms at high water.

Binanan islets are two small islets in the middle of the bay, near the coast; between them, and about them the depth is 4½ fathoms.

On the western shore are the towns Mangurukuru and Pili, the last standing on a little height on the western point of the bay. Sal islets are united to the coast off Pili by a reef having three-quarters of a fathom on it at low water.

Calabazas isles are two islets of little height and extent to the southward of Sal islets, and three-quarters of a mile from the coast of Panay; the southernmost has a steep beach of sand on its northern side, where there is anchorage sheltered from the south-west. The soundings on the outside of these islets are 4½ to 8 fathoms; between them 3½ fathoms, and between them again and the coast of Panay, 5½ to 7 fathoms.

Pepitas rocks, one and a half miles to the southward of the Calabazas are some black rocks 7 feet high, about one cable in extent, vessels can pass between them and the coast, and also between them and the Calabazas.

Coast.—Kulasi bay and Cañas gulf offer no shelter. Barotak bay has a depth of 3 fathoms; a river of the same name enters it, in which boats can ascend at high-water to the town of Barotak. The point which separates this bay from the next, Banate, is surrounded by rocks, steep-to, which continue round the shore in front of the town, Banate. From here the coast trends to the southward for 13 miles to point Dumangas, and then west 5 miles to the river Dumangas; it is low and covered by mangroves, and is unapproachable on account of shoal water, there being a depth of 1½ fathoms at a distance of 3 miles in places. The rivers Anilao and Dumangas are shallow, and boats can only enter them at high water.*

Mounts Orok and Saligit are about equal in height, but mount Orok has a small sharp peak, and mount Saligit a long flat summit. When in line they serve as marks for the eastern end of Iguana shoal. Mount Kolan, or Kolait is low, and not conspicuous until bearing west.

Tomonton shoal, off point Tomonton in Negros, stretches 2½ miles to the north-west, and must be given a wide berth; it has 1½ fathoms at its end, and is said to be extending.

Iguana bank is a long spit of sand in the middle of the eastern entrance of Iloilo strait, between point Dumangas and the island Guimarás. The shallowest part of the bank, on which the least water is 1½ fathoms, is half a mile in length, E.N.E. and W.S.W., and 3 cables wide. From it Dumangas Vantay bears N. by E., and the largest of the Siete Pecados N.W. by W. ½ W. A patch of 2 fathoms† lies 8 cables north-west of this position, and the part of the bank covered with less than 4 fathoms water lies between the bearings S. 20° E., and S. 53° W. from Dumangas Vantay, and S. 53° E. and S. 73° E. from the largest of the Siete Pecados. On this arc of 20° the light on Siete Pecados shows a *red sector.* Mounts Orok and Saligit in line over Dumangas Vantay, bearing N.W. ¾ W., clear the eastern end of this shoal.

The channels between this limit of 4 fathoms round the bank, and the same depth off the coast, are about a mile wide. In the northern channel the least depth is 4¼ fathoms, and in the southern 6½ fathoms at their eastern entrances. The tidal streams set with great force over Iguana bank.

Siete Pecados is a cluster of rocks lying in mid-channel of the north of Guimarás. The highest from which a light is exhibited is 25 feet above the sea, and all of them are steep; but on the ends of the shelf on which they stand, and which measures about half a mile north-east and south-west, there are rocks with very little water on them. A rock with 4 feet of water over it, on which the *Marquis de Victoria* struck, lies 270 feet from the north-west islet of the group; it is a pinnacle with 8 and 9 fathoms all round it, and lies out of the usual track.

The channel between the Siete Pecados and the coast of Panay is half a mile wide, and 9¼ to 20 fathoms deep; the channel between them and Guimarás is of the same width, and 7 to 10 fathoms deep. Both are clear, but the northern is preferable. Vessels should keep nearer to the islands than to the coast of Panay.

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* *See* Admiralty chart:—Ports in the Philippines, No. 2,391; scale, $m = 2{\cdot}0$ inches.

† The Spanish Derrotero gives one fathom.

From this to the port of Iloilo the course is clear.

LIGHT on SIETE PECADOS.—An iron lighthouse, 29 feet high, coloured bluish grey, is erected on the southern cliffs of the largest islet of this group, in the northern part of Iloilo strait, exhibiting a *fixed* white light showing a red sector through an arc of 20°, or between the bearings of N. 74° W. and N. 54° W. (covering Iguana bank); it is raised 98 feet above the sea, and should be visible in clear weather from a distance of 11 miles.

Currents.—The flood tide in Iloilo strait passes to the north as far as Pan de Azucar, approximately, where it meets the other branch of the flood tide coming from the northward. The ebb stream runs in the opposite direction, *i.e.*, to the southward in Iloilo strait, and to the northward north of Pan de Azucar. The velocity in the strait reaches 4 to 5 miles an hour.

GENERAL DIRECTIONS from Verde island passage to Iloilo, eastern route.—The directions for Verde island passage as far as Dumali point have been given in the last chapter. From a position 4 miles north-east of Dumali point a S.E. course will lead between Dos Hermanas and Maestro de Campo islands and south of Simara; then Cobrador island should be steered for until the channel opens between Romblon and Tablas islands. After rounding the north-east point of Tablas a south course takes a ship in mid-channel and clear of all danger. The light of port Romblon is badly placed, and scarcely discernible, it is not an official light. By night this south course should be kept for 14 miles, then a S.E. ¾ E. course leads 2 miles south of the southern end of Cresta de Gallo reef and midway between Jintotolo island and Zapata Mayor. If the weather is misty the first land seen will probably be the high and conical hill of Olutaya on the northern coast of Panay.

From 2 miles south of Jintotolo island a course S.E. by E. ½ E. should be steered for 9 miles until the peak of Pan de Azucar bears S. by W. ¼ W., and then a south course towards the highest hill of Sikogon island. This will lead between Balbagan and Tulunanauan islets, in depths of 7 and 8 fathoms, and half a mile east of the 2¾-fathom patch between Balbagan and Lulugban islets.

The east point of Cañas islet in line with same highest hill of Sikogon will clear that 2¾ patch. When east of the north point of Kalagnan islet steer for the middle of the channel between

Kalagnan and Sikogon, south of Cañas. This channel passed steer S. by W. ½ W. to clear the reef of the island Culebra; when west of that island steer to pass between Buglug on the S.E. coast of Pan de Azucar and Malangaban, then between Bulubadiangan and Sombrero, which is half a mile to the N.W. of it, then through Apiton channel between the coast bluff and Tugubanhan, and enter the strait of Iloilo. All these channels are clear and the least depth is 7 fathoms. After Apiton channel the Calabazas islands and Pepitas rocks, which are safe, will be passed at one to 2 miles distance.

Vessels drawing less than 13 feet can pass between point Bulakau and Manigonigo islet, but this channel is not recommended.

If it is proposed to pass outside the islands, after passing between Balbagan and Lulugban when abreast of Tulunanaun steer S. 27° E. until Baliguan islet bears south, a course south for that islet will then lead half way between the patches of 2¾ and 3¾ fathoms (p. 236). From Baliguian a course S.W. ½ W. will lead between Anauayan and Ilakaon on the north coast of Negros, taking care to avoid Turia rock. To clear this rock a vessel should not pass west of the south point of Tugubanhan until the southern extremity of Calabazas bears W.N.W., she can then steer W.S.W.

If it is preferred to pass northward and eastward of the Gigantes, North Gigante should be passed at the distance of 1½ miles, and either the Sikogon and Apiton passage may be taken, or the Anauayan channel.

From Apiton pass or Anauayan channel, whichever has been taken, a course should be steered to pass 3 miles from Tomonton point in Negros, and then a S.W. by S. course should be shaped for 12 miles, keeping a look out for the reefs off the coast of Panay. When the highest of the Siete Pecados bears W. ¼ N. a course should be steered for it, gradually approaching the fishing stakes on the Panay side; this will lead clear of the shoal water off point Dumangas and that extending W.N.W. of Iguana bank. These fishing stakes are generally in 2 fathoms water, and at one or two cables from them the depth is 9 to 11 fathoms.

Directions for Iloilo strait.—Coming from the eastward and passing north of Siete Pecados vessels should round Dumangas point at a distance of one mile, and keep within the white light of Siete Pecados, avoiding the *red* sector. From abreast the light, a mid-channel course should be maintained to Kabugao point, when the *red* light at Iloilo may be steered for, keeping rather to the Guimarás shore.

To pass southward of Siete Pecados, the light should be approached bearing about N.W., avoiding the *red* sector, and the bank extending about one mile north-eastward of Nabalus village. A small shoal lies in the mid-channel about south from the light, which will be avoided by keeping more towards the light when it approaches the bearing of north. When westward of the light, proceed as directed before.

Northward from port Iloilo,—leaving Iloilo by the eastern channel, the Pecados rocks, in line with a fall of the hills in the back range of Panay island bearing W. ¼ N., will lead between Iguana bank and the shoal water off the northern shore; and when mounts Saligit and Orok are in line, bearing N.N.W. ¾ W. and point Tomonton N.E. ¼ E., a N.N.E. course may be taken.

CHAPTER VII.

NEGROS, SEBU, BOHUL, AND LEITE ISLANDS; SURIGAO STRAIT, AND THE NORTH AND WEST COASTS OF MINDANAO.

Variation 1° Easterly in 1889.

NEGROS ISLAND.—So called from the number of Negrotis or Aetas, found on it by the Spaniards, is about 118 miles long, and, though larger than Sebu island, is neither so rich nor so populous. Its coast is very little broken by bay or inlets, and does not contain any good harbour. A central chain of mountains runs through it from north to south, which attains its greatest height towards the latter point. The rivers are but small, and unfit for the navigation of vessels of burthen.

The island produces the best cacao in the Bisayas, besides rice, maize, sugar, tobacco, cotton, and abacá. The population is about 200,000—chiefly Bisayans.*

NORTH and NORTH-WEST COASTS of NEGROS.—**Point Sagai,** or Carey—Bito on English chart—the north-east extremity of the island, is of no great height, rocky, and surrounded by a shoal of half a mile extent, which dries in places at low water. The space between this point and the Dun islets has not yet been surveyed.

Bokabok island, 2¾ miles north-east of point Bito, is of half a mile extent, and stands, along with several islets and rocks at the west of it, on a shoal which extends 4 miles N.W. and S.E., and 2½ miles N.E. and S.W.

Coast.—From point Bito or Sagai, to the north point of the island, 15½ miles W. by N., the shore is foul and rocky, with soundings of 3½ to 5 fathoms at a distance of 1½ miles from it. Three sandy shoals, which uncover at low water, lie N.N.E. ½ E. of point Guimugahan; the southernmost being 3½ miles, and the northern one 10 miles from the point. The north point of the island is an extensive, rounded, sandy cape, on which is a *Vantay;* it is surrounded by a shoal extending 4′ to the northward, including Ilakaon islet.

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* *See* Admiralty chart:—Sulu or Mindoro sea, No. 2578; scale, *m* = 0·1 of an inch.

From the north point to point Tomonton 15 miles W.S.W., the shore is a long sandy beach, with a depth of 3 fathoms at about a mile from it. From point Tomonton, a shoal extends 2½ miles to the N.W., and has 1½ fathoms on its end. Vessels navigating Iloilo strait must give this point a berth of 3 miles. (*See* Chap. VI., page 239.)

From point Tomonton to Pandan, 24 miles S. 20° W., the coast is low, and bordered by a long sand beach, with soundings of 5½ fathoms at half a mile from it. Point Pandan, which with Guimarás island forms the narrow straits of Guimarás (*see* p. 214), has rocks on its north-west side, projecting to half a mile, with 7 fathoms near them.

Points, Pandan to Sojoton.—From point Pandan, the coast continues low for 28 miles to the southward, as far as the town of Suai, near the river Jimamailan; the 1½-fathom shoal which borders point Pandan grows out between that point and Makikili, to 4 miles from the land, almost joining the bank south-east of Ilampulugan; but, to the southward of the latter point, it closes the coast and a depth of 3½ fathoms is generally found at one mile from the coast.

River Jimamailan.—Of the several small rivers that enter the sea on this coast, this river, near the town of the same name in the angle that the coast makes to the westward, is the most important. The entrance is indicated by stakes, placed by the natives in 1½ to 2 fathoms depth; within the river, the best anchorage is near a copse on the left bank, where the water is deepest. Near Suai the coast curves to the westward, and increases in height; about point Sojoton it is high.

Shoal.—A patch of 5½ fathoms lies 1¾ miles north of the town and hill of Tantanaian, with 50 fathoms at the distance of 1¾ miles north of it.

WEST COAST of NEGROS.—Point Sojoton is surrounded by reefs to the distance of half a mile, with 7 fathoms at the edge, and 27 fathoms at 1¾ miles to the west of the point. Makiliguian point, a wooded bluff, is also surrounded by rocks. Linaon bay, between these two points, affords anchorage in case of necessity in 7 to 9 fathoms, fine sand.

Shoals.—A small rocky shoal, with 3½ fathoms on its outer edge, lies S.S.W. half a mile from point Makiliguian; and another, with

8 fathoms on its outer edge, lies 1½ miles from the point, on the same bearing.

Danjugan island, 2 miles north of point Binigsian, is one mile long, north and south, and is surrounded by a narrow, steep reef; between it and the coast is another little islet, the channel between which and the coast has a depth of 8 fathoms.

Point Binigsian.—Half a mile south-west of this point are Anajaugan island and four other little islets close to it. South of the point there is anchorage in 9 to 17 fathoms, where good water may be obtained; still farther south are the bays of Cartagena and Sipalai.

Point Matatindok is steep, with a flat crown, and is surrounded by rocks, one of which has the appearance of a vessel under sail.

Campomanes bay, south of point Matatindok, is clear, and of great depth, with very steep shores, there being 17 to 28 fathoms almost touching the shore. Nabulao bay, south of Campomanes, is obstructed by an islet, and by a reef which extends from both sides; before it is a shoal, surrounded by deep water, situated ¾ of a mile south of the point between the two bays.

SOUTH-WEST AND SOUTH-EAST COASTS.—From Campomanes bay to point Kauitan the shore is rocky; but it is safe and steep-to, soundings showing no bottom with 37 fathoms at half a cable distance in many places. From point Kauitan to point Siaton, the south point of Negros, it is also safe and steep-to, and presents several beaches including the mouths of small unimportant rivers. During the north-east monsoon vessels can anchor off the town of Tolon, of 1,800 inhabitants, but boats only can enter the river at high water.

From point Siaton to point Dumaguete the shore is sandy and clear, with soundings of 2¾ to 6 fathoms at one cable from it, falling then abruptly to 32 fathoms.

Port Bombonon, one mile north-west of the point of the same name, is 2 miles wide and 5½ fathoms deep, and completely sheltered; but the entrance is reduced to a width of *75 yards*, and a depth of 2¾ fathoms by a ridge of rocks extending from the south shore.

Port Siit is small but clear, with good holding ground, and sheltered; the depth within is from 3¾ to 8 fathoms, and there is a rivulet with good water.

Point Samboanguita is flat and sandy; a shoal of 2 fathoms extends 2 cables from it. South of the point there is good anchorage in 7 fathoms. The town of Samboanguita, of 3,700 inhabitants, is a mile inland of the point.

Point Dauin is sandy and flat, with trees on it rather higher than those that grow on the other points of the coast; it can be passed close-to, as it is clear and steep—as is also the entire coast between points Samboanguita and Dumaguete, being sandy, clear, and steep, with 12 fathoms at a short distance.

Apo island is 300 feet high, visible 24 miles; it is clear and steep-to, except on its western side, which is rocky; it is one mile long north and south, and of medium height.

Current.—In the channel between Apo and the coast of Negros, the current passes constantly from north to south with variable velocity.

Point Dumaguete is a flat, salient point of sand, to the north of which is the town of Dumaguete, the largest in the province, of 13,000 inhabitants, chiefly engaged in collecting turtle shell. Anchorage can be had off the town, in 7 fathoms, but it is bad, as vessels are liable to drag off into deep water.

TAÑON STRAIT, between Negros and Sebu, is 90 miles long and 14 miles wide at the northern part, and 3 miles wide at the southern entrance. The shores are steep, and little frequented.

EAST COAST OF NEGROS.—From point Bito, which has been described above (p. 243), the coast trends S.E. for 7 miles to point Mokabok, and is bordered by a reef which extends more than half a mile from it.

Bagunbanua islet is situated on the south-west part of a reef which extends 2½ miles N.W. and S.E., with a detached rocky patch to the north; the channel between the islet and the coast-reef is 4½ fathoms deep, and is only fit for small coasters.

Danao river.—Between points Mokabok and Okre, which are both of yellow clay and steep, is the mouth of the great river Danao with a depth of 2¾ fathoms on the bar at low water, and 5½ fathoms up the stream.

Point Tiklin, 19 miles S.W. by S. of point Okre, is flat and covered by mangroves. The Spanish chart shows an islet on its north-east part, with a shoal projecting three-quarters of a mile to the eastward. On the northern and western sides of an islet, in a bay 1½ miles north of point Tiklin, there is anchorage in 4½ fathoms; there is no passage between this islet and the point to the southward.

Point Ta~~b~~hon, 3 miles south of point Tiklin, is low and sandy; the sandy beach between the two points must not be approached closely, as the water is shoal.

Island and anchorage Refugio.—Refugio island is about 1½ miles long north and south, and one mile wide; the north part is high; off the south part is a little shoal. The channel between Refugio island and the coast is about a mile wide, and affords good anchorage in 12 fathoms, mud. The channel can be entered from either end, but a wide berth must be given to the shoal off point Tiklin, and to the western point of Refugio.

Tides.—North of Refugio the flood stream sets to the south-west and the ebb to the north-west, but south of Refugio they set in the opposite direction.

Coal.—Layers of coal have recently (1879) been discovered in this part of Negros, and outcrops of coal have been found in the rivers which enter the sea near the towns of Calatrava and Talabe.

Coast.—From point Tabon to point Panai the coast is steep, clear, and covered by mangroves. Point Jilaitan is steep-to. Point Panai is flat and sandy, with rocks on its northern side; there is anchorage in 3 fathoms to the southward of it before the little town and river Guijolgan. Between Guijolgan and Kateal a shoal extends to a short distance.

Point San José is low, very steep, and surrounded by boulders; from this point to the Bais islands the coast is steep and clear.

Bais islands are two high islands surrounded by sand banks, which extend 2 miles to the north-east, and appear almost to fill the bight of the coast in which they are situated, between points Teka and Kanamai; both these points are foul.

Point Amblan is flat, steep, and clear; not far from it is the town of Amblan, of 5,000 inhabitants, engaged in the cultivation of cacao. There is anchorage before the town in 4 to 13 fathoms, sand.

The southern entrance of the strait of Tañon is very narrow; the shores are steep, and the tidal streams at springs reach a velocity of 5 to 6 knots, with strong races and eddies; at neaps the velocity is 2 to 3 knots. A fuller account of these tide streams will be given after the description of the eastern side of the strait.

BANTAYAN ISLAND, 8 miles west of the North point of Sebu island, is 10½ miles long N.N.W. and S.S.E., and 4 miles wide The highest part is about the centre and eastern side, and is visible in clear weather at a distance of 18 miles.

Point Lauis, the northern extremity is flat and sandy; from it a rocky ledge extends 2 cables to the northward, with 3¾ fathoms off its end; from here the depth slowly increases to 9 fathoms at the distance of 2 miles. To the westward of the ledge, and not far from the town of Lauis on the point, small vessels can anchor in 2½ fathoms, sheltered from the eastward by the ledge which breaks the sea.

From point Lauis the coast trends S.S.W. 4½ miles, sandy, and covered by mangroves, to point Patao, the western point of the island; from this point a reef projects three-quarters of a mile, and borders the south-west coast, closing in to it again near the town of Bantayan—a town of about 7,000 inhabitants, engaged chiefly in pearl shell fishing; only small coasters can approach it.

An extensive shoal spreads out to the south-west of Bantayan, on which are the nine islands called Dun; they are low and flat. The southern part of this shoal, and the southern coast of Bantayan, have not been surveyed.

The south-east point Ogton is flat, and has a narrow fringing reef with 10 fathoms at its edge; the coast for 10 miles to the N.N.E. is sandy, and offers shelter from south-westerly winds in 5 fathoms. The north-east coast is foul. Jilantaguan islets, the largest of which is 2½ miles north of point Ogton, the S.E. point, are clear and steep-to; the channel between them and the coast is clear, but gives bad anchorage.

Guintagan island, midway between the north point of Bantayan and the northern part of Sebu, is 150 feet high, flat and wooded; its sides are clear and steep to.

Shoal.—Between Guintagan and Jilantaguan islets, is a patch of 2¾ fathoms; between it and Guintagan there are 40 fathoms, and between it and Jilantaguan, 28 fathoms.

Malapascua, the native name of which is Lugon, is 2 miles long north and south, and one mile wide; the east and west sides are safe and steep, and show beaches of white sand, separated by rocky bluffs and mangroves.* To the north and north-west of it, and close to it, are three islets. A bank of sand and rock covered by three-quarters of a fathom water extends to two-thirds of a mile to the south and south-east of the island. Vessels can anchor in 7 to 11 fathoms, sand and mud, in the channel that separates the island from Chocolate islet; and also to the northward and eastward of the island.

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* The Spanish chart shows a narrow reef surrounding the island.

Chocolate island, one mile to the north of point Bulalaki, the northern part of Sebu island, is a small circular island one cable in diameter, 250 feet high, conspicuous, and rather higher than Bululaki point. It is wooded, clean and steep, with 7 fathoms water close to its shore.

SEBU ISLAND.—Sebu is an island of some importance and interest, as its port has been thrown open to foreign commerce. It is long and narrow, 114 miles in length with a greatest width of 18 miles in the northern part. A chain of mountains traverses the island through its entire length, containing beds of mineral coal and, it is stated, veins of gold. The rivers are numerous but small, and generally unfit for either navigation or irrigation. With the exception of a few fine valleys, cultivation is confined mainly to the sea-board. The population of the island is estimated at 38,000 souls. The chief exports are sugar, oil, hemp, tobacco, coffee, and piña silk; the chief imports are European goods, coal, and rice.

WEST COAST.—Bulalaki point is low, rather steep, with a flat summit covered by trees and presenting to the north and south some yellow patches. Vessels of all sizes can anchor in the channel between this point and Chocolate islet, in 8 fathoms, mud, near the islet, and 2¾ fathoms, sand, almost touching the point.

Bantiki point (Kandaga), the north-western point of the island, about 4½ miles from point Bulalaki, is very low, a shoal of sand projects half a mile from it, with three-quarters of a fathom on it; the coast between in and point Bulalaki shows sand beaches, and has good holding ground off it. The town of Kandaga, a poor town of 1,000 inhabitants, lies S. by E. of the point.

The coast from point Kandaga is very clear, with a depth of 4½ fathoms off it to the town of Paibai, or old Bantayan, but thence to point Kauit a bank of 3½ fathoms extends to half a mile from the shore.

Point Kauit, 6 miles S.S.W. ¾ W. of point Kandaga, is very low and sandy, and is surrounded by a shoal of sand and rocks 2 cables wide, covered by 1½ fathoms. Abundant fresh water is obtained here from wells.

Jibitnil island, less than a mile from Kauit, is 2 miles long north and south, and clear, ending to the south in a point of sand. The passage between it and point Kauit is less than a mile wide, and 4½ to 25 fathoms deep.

Daijagon bay is very foul; the reefs reduce the available space to a width of one mile, in which there is anchorage in 8 fathoms.

The shores are low and covered by mangroves. From the interior of the bay a narrow, tortuous estuary communicates with Bogo bay on the eastern coast, reducing the isthmus here approximately half a mile wide to a neck of land one cable in width. The natives pass their *baratos* across from one coast to the other in both monsoons to avoid going round to point Bulalaki. The canal is said to be filling up, and had a depth of only 4 feet of water only in 1880.

Point Magtulinok is a narrow tongue of sand on which are several little steep flat-crowned rocks, with a shoal of 2 cables extent at its end.

Point Makao is low, and clear on its north part, but from its south part a reef extends from before the shallow river Lambusan to half a mile from the shore with 7 fathoms at its edge.

Jaliki river can be entered by small coasters through a passage of 3½ fathoms between the reefs; the depth on the bar is 3 feet at low water. The northern point is of black rock underworn by the currents. The coast from Jaliki river to Tubukan river is bordered by a reef a quarter of a mile wide.

Batauan bay is very small, and the greatest depth inside is only 3 fathoms; the entrance points are higher than the rest of the coast in sight about this part.

Point Langugon is low, clear, and steep-to, and offers anchorage on its southern side. Tubukan river is of no importance, and the bay is filled by a reef which extends round the western point to a distance of half a mile.

Buenabrigo point is low, sandy, and very steep-to; on the northern side is a rivulet of good water, and on the south side there is anchorage sheltered from the N.E. Between Buenabrigo point and Balamban bay the shore is fringed by a reef which advances in one place as much as 1½ miles. Balamban bay is foul and affords no accommodation.

Point Tajao is low, clear, and steep-to, with 23 fathoms off it; vessels can anchor south of the point in 1¾ to 7 fathoms, sand. The tidal streams that enter Tañon strait from the north and from the south meet about off this point.

Tajao bank, 1½ miles S.S.W. ½ W. of the point, is one mile long N.E. and S.W. and half a mile wide; it is a bank of rock, and uncovers at low water; the channel between it and the coast is unsafe. From Tajao point to point Gorda the coast is fringed by a reef which extends in some places to one mile from it.

Point Gorda, the highest on the coast, is steep with a flat crown; there is a *vantay* on it.

Barili is a town of 17,000 inhabitants, but the river has only 2 feet on the bar, and the creek at the entrance, which is a third of a mile wide between the points, is considerably reduced by reefs from both sides; the depth in the creek is 9 to 2½ fathoms.

Point Dumanjok is high, with mangroves at the base, where a ledge extends 2 cables to the north-east. At a distance of 2 cables from the ledge the soundings show no bottom with 110 fathoms. The bay to the eastward has a depth of 17 fathoms at the entrance, lessening to 5 fathoms near the shore. A town of 600 inhabitants is at the bottom of the bay near a small river of good water.

Point Kopton is low, of dark rock much underworn; it is surrounded by a reef half a mile in width, which quite fills up the bay to the eastward. The islet Pescador, 3½ miles S.S.W. of point Kopton, is surrounded by dark rock, with no vegetation on it; its sides are steep-to.

Badian.—This town of 2,300 inhabitants can only be approached in boats at high water, as the wide bay in which it is situated is lined with salient reefs; there is no passage between these reefs and Badian island.

From Badian to the southern end of Sebu island the coast is clear, of moderate height, and so steep that anchorage can only be had very close to the shore in various places where there are towns. The town of Kinatilan of 7,700 inhabitants is in an angle of the coast near the hill Tuburan; before the town the depth is 7 fathoms at one cable distance from the shore.

Point Kolasi is low, rather craggy, and white, with a telegraph on it. From here to point Liloan 2½ miles to the southward the coast is sandy and very steep, with rocks close to the shore.

The tidal streams are very strong off this point.

Point Liloan, 3½ miles south of point Kolasi, is sandy and steep, with some rocks, covered by 1½ fathoms at a quarter of a cable from it. On the point is a stone fort, and a signal station which communicates with Kolasi. Vessels can anchor near the point in 7 to 14 fathoms, but the bottom is very steep, and the tide streams very strong. Between point Liloan and point Tañon in flood tide an eddy current in the opposite direction passes very close to the coast.

South entrance of Tañon strait.—From point Liloan the coast trends E. by S. for 2½ miles to point Tañon, and consists of sand-beaches with a depth of water of 5½ fathoms very close to, and 17 fathoms at a distance of one mile. Point Tañon is low and sandy, with a narrow ledge of rock projecting to one cable from it.

Tides.—The flood stream from the strait of Surigao, passing westward between the islands Bohul and Sikijor, strikes the coast of Sebu at the point Dalaguete, and divides into two branches, one turns north-west, and the other arm turning to S.S.W. meets with another part of the stream that was deflected from Negros island about point Damaguete; the two, re-united, enter Tañon strait by the southern entrance with a velocity that reaches 5 to 6 knots in springs and 2 to 3 at neaps, with violent races and tide-whirls. The stream here flows northward, lessening in force as the strait widens, until it reaches the parallel of point Tajao, where it meets the flood stream from the northward. At the northern entrance of Tañon strait the tide, even at springs, does not reach a speed of 3 knots. The ebb stream is directed the reverse way from the parallel of point Tajao. As a resultant of the tides there is always, on the south-east coast of Negros between the points Damaguete and Bombonon, a constant current to the south, with varying velocity.

EAST COAST of SEBU, from north to south.—Point Bulalaki and Chocolate islet have been described above. From point Bulalaki to Bogo bay, 13 miles S.S.W., a reef of sand and rocks fringes the shore, and extends as much as 1½ miles from it, at one place, about 3 miles south of Bulalaki; the depth over this reef is three-quarters to 1¾ fathoms, and at its edge from 4½ to 14 fathoms fine sand.

Bogo bay is nearly filled by shoals that advance from its sides, leaving only a narrow channel to the head of the bay where the town of Bogo is situated. The shoals are reported to show clearly, and to be marked by bushes. A narrow neck of land separates Bogo bay from an estuary on the west coast of Sebu, and the natives pass their *barotos* across in preference to going round point Bulalaki.

Anchorage may be obtained in Bogo bay in bad weather, but it is recommended not to go into less than 4 fathoms, as the water shoals rapidly, and the bottom consists of sand and rock.

Nailon (or Mailon) point is low and surrounded by a narrow reef; the coast between it and point Saak, which lies S. by E. 4½ miles, is clear and steep-to, and consists of sand beaches interrupted by rocks and mangroves.

Point Saak is low and wooded, clear and steep-to. A low range of hills lies 2 or 3 miles inland, and shows a hill 1,122 feet above the sea, W.S.W. of point Saak.

Capitancillo islet, which lies east 2½ miles from point Saak, is low and circular in form, about a cable in diameter, with a few trees on it, and a sand beach on its western side; this side is clear, but on the northern side there is a narrow reef, and on the eastern and southern sides shoals extend to a distance of half a mile, with 18 fathoms close to the edge.

At a distance of one mile N. by E. of Capitancillo islet is the southern end of a shoal of sand and rock that stretches 1½ miles N.N.E.; this shoal is covered by 1¼ fathom on the shallowest part, with a depth of 18 to 37 fathoms round its edges, and 32 fathoms in the channel that separates the shoal from Capitancillo islet.

Between these dangers and the coast of Sebu there is a clear channel with no bottom at 55 fathoms.

Kalangaman islet lies 12 miles N. 71° E. of point Nailon; it is small and low; on its east and west sides are shoals which dry at low water; and about a mile to the south-west of the islet there is a shoal half a mile long north-east and south-west, and a third of a mile wide; the depth over it is 1¾ fathoms, and round its edges 14 to 18 fathoms. 2

Danger.—The Spanish steamer *Ocmoc* struck soundings in 12 feet in the channel between Kalangaman and Capitancillo islet. It being night no bearings were taken; it is shown on chart 2,578 as lying 7 miles E. ½ S. of point Nailon, position doubtful.

The channel between Capitancillo and Sebu is generally used by steamers.

Point Bantulin, bearing S. ½ E. 5 miles from point Saak is of uniform height, rocky clear and steep-to. To the north-west of the point is Tabagon bay in which there is anchorage in 3¾ to 9 fathoms, sand and mud, before the town of Tabagon. The shores of the bay are covered with mangroves, and must not be approached within one cable.

Coast.—From point Bantulin the coast trends S. 20° W. for 5½ miles to point Bugod; it is low and steep-to and of no great height, consisting of sand beaches separated by rocky bluffs which are surrounded by rocks to the distance of half a cable. The river Jamuguit enters the sea about 2 miles north of point Bugod; at the mouth of the river, very close to the shore there are soundings of 6 fathoms, sand.

Point Bugod is low, rocky, and steep-to; the coast between it and point Pinulakan, 7½ miles to the southward is of medium height, and consists of sand beach with good depth and anchorage off it. On this coast there are three towns: Bugod, of 3,000 inhabitants is no a rising ground surrounded by hills: Bacio is very small: Katman contains 4,600 persons: the depth of water off this town is 6 to 22 fathoms, sand. Point Pinulakan is of no great height, clear and steep-to. Luyan, to the south of it, is a town of 500 people occupied in cutting wood, which is sent to Sebu.

Point Katadman, which lies S. ½ W. 21 miles from point Bantulir, is very flat and covered by mangroves; there is a signal station on it, and a shoal surrounds the point, extending from Danao river on the southern side, as far as the little port of Bugut on the northern side; on the outer edge of this reef there are 8 to 17 fathoms, sand and mud.

Port Bugut, or **Carmen,** is a small nook situated 3 miles N. by W. ½ W. of point Katadman sheltered by the low islet Pupú. The eastern side of this island is foul, and there is no passage between the northern side and the shore. The channel leading to the port is on the south side of the islet, and is reduced by shoals on both sides to a width of 5½ fathoms; these shoals wash at low water, and are marked by bushes. Within the port the depth is 4½ fathoms, lessening towards the beach which is low and covered by mangroves. The town is on the south side, and consists of about 20 houses. In December 1879 two Spanish gunboats rode out a typhoon in this port.

Directions.—In order to enter the port the land should be closed to about a mile from the shore, care being taken to clear the reef that borders the coast, and when the fort at the bottom of the port bears W.N.W. a course should be steered for it on that bearing, which will lead clear of the shoals on either side. Without a pilot it would not be safe to attempt to enter at night.

Coast.—From point Katadman to Danao the coast is foul, and the anchorage off Danao, which is a large town of 12,000 inhabitants, cannot be recommended. From Danao to point Bagakai the shore is sandy, and, except about point Dapdap where the water is shoal, offers anchorage in good depths to vessels of all sizes during the south-west monsoon. Liloan, situated on the left bank of the river of the same name, is small, and with the town of Dapdap only numbers 6,500 inhabitants; the river can be entered by *lanchas* at high water.*

Point Bagakai, bearing south 9 miles from point Katadman is low, ragged, and surrounded by rocks.

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* A large and flourishing town named Compostella is said to exist 5 miles south of Danao, but it is not shown in the Spanish charts.

Steering for Sebu from the northward, point Bagakai when first seen looks like an island, as there is a round-backed hill upon it about 150 feet high. Maktan and Olango are both low.* (*See* pages 256 and 263 for fuller description of these islands.)

LIGHTS.—On Bagakai point a fixed *white* light is exhibited on a circular tower, 46 feet above the sea, and 21 feet above the ground, visible at a distance of 9 miles. The light-keeper's house is of nipa, and separated from the tower. The light is very difficult to distinguish, the fishing lights in the vicinity being very numerous and much brighter.

A harbour light is exhibited from a lighthouse on Third Vantay point, northern extreme of Maktan island. It is a fixed *red* light, elevated 39 feet above the sea, and should be visible in clear weather from a distance of 7 miles. The lighthouse, 25 feet high, consists of an iron tower, painted gray; the keeper's dwelling is near it.

Coast.—From point Bagakai the coast trends S.S.W. for 3½ miles to the northern point of a shallow bay at the entrance of the strait leading to Sebu. Near this point is the northernmost buoy marking the entrance to port Sebu, shown on the plan of the port as lying N.W. by N. 1½ miles from the north point of Maktan island. On both sides of the entrance there are fishing stakes which serve to mark it.

SEBU PORT† is formed by the channel which separates Maktan island from Sebu. The practicable channel is 2 cables wide in the narrowest part, which is abreast of Mandani tower, and 3 cables wide before the town of Sebu; the least depth in it is 4½ fathoms, increasing in many places to 9 fathoms. It is marked along its whole course by a series of buoys, painted in vertical stripes: those on the Sebu shore are *black* and *white*; and those on the Maktan shore are *red* and *white*. The presence of these buoys must not be relied on, as in 1881 a number of them had disappeared, but in their absence, the tide rips on the edges of the shoals, and the colour of the water will indicate the passage. In daylight the navigation presents no difficulties, but on a dark night when the edges of the reefs cannot be seen it is not safe.

The towers of Mandani on the Sebu coast, and of Opon, on Maktan island, are white. The bank which extends north-east of Mandani tower is covered with grass and is generally dry.

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* Report of Exploring Voyage of H.M.S. *Challenger*. Vol. I., p. 647.

See Admiralty plan, Ports in the Philippines, No. 2,391; scale, $m = 1{\cdot}95$ inches.

The town of Mandani lies near the beach in the bight of the coast westward of the tower; it has a population of 10,500 persons, chiefly engaged in sugar cultivation.

Maktan island consists of an old coral reef, raised a few feet (8 or 10 at most) above the present sea level. At the northern part of the island, where a convent stands, a low cliff fringes the shore, being an upper stratum of the upheaved reef. The raised reef is here preserved, but over the portions of the island immediately fronting Sebu it has been removed by denudation, with the exception of a few pillar-like blocks which remain, and which are conspicuous from the anchorage. The surface is scooped out into irregular basins and sharp projecting pinnacles, and covered in all directions with mud, resulting from the denudation.* Nearly all the island is covered by mangroves, but on the part left dry there are plantations of coco-nuts.

From the northern point of the island near the entrance to port Sebu a ledge extends 6 cables to the N.E. by E., the edge of which is generally marked by fishing stakes; the north-west shore is fringed by a narrow reef, but on the south side the reef stretches out to 2 miles from the island, with 5½ to 8 fathoms at the edge. The north-east side is clear and steep-to; the channel between Maktan and Olango island is 1½ miles wide, clear and deep.

The only town on the island is Opon, on the west coast, south-west of Mandaui point in Sebu; the population amounts to 9,000, chiefly engaged in fishing and tending the salt-pans. It was here that Magellan was killed in 1521, after making the first passage across the Pacific.

The town of Sebu is the most ancient in the Philippines; it is the seat of government of the Bisayan islands, which include Sebu Bohal, Panay, Negros, and Leite; and it is the residence of a bishop. It is built on a large plain at the foot of the chain of hills that traverse the island throughout its length, and is a well constructed, thriving place; the merchants' quarter is situated along the port, and includes some well built stone houses, though many are of old construction. The huts of the Malays, for the most part fishermen, are on the beach, and form the west part of the city. The fort is a triangular edifice of stone, painted red, with an open square in front of it.

Trade.—A considerable trade is carried on, the articles exported being chiefly sugar and Manila hemp. The sugar is of inferior quality, and principally used in distilling, and for making beer; its value is from £12 to £15 per ton. The imported goods, consisting chiefly of cotton stuffs, come from Manila through the Chinese traders there who purchase from the foreign merchants.

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* Report of exploring voyage H.M.S. *Challenger*, 1874.

The neighbouring islands of Leite, Mindanao, and Kamiguin possess extensive hemp plantations, a large proportion of the produce of which finds its way to Sebu for shipment.

In 1882 the imports were valued at $39,932, and the exports at $2,677,217. In 1883 105,068 piculs of hemp were shipped, valued at $1,764,568. The export of sugar was 371,488 piculs, valued at $1,764,568.*

Supplies.—Provisions are plentiful, beef very bad, 10 to 12 cents a lb.; fowls $3 to $3½ per dozen, eggs $3½ per 100; vegetables and fruit scarce; fish plentiful and moderate. Water is not obtainable for the shipping.

Coal.—The supply is very small, chiefly Australian; price $16 per ton. The coal station is at Kauit point, 1¾ miles south-west of the town; the coal is brought off in bulk, and the process of coaling is slow. There are beds of coal in the island, but only the surface coal is worked.

Anchorage.—The best anchorage is S.S.W. of the fort in 5 to 7 fathoms, mud; nearer the southern reef there is more water, but the bottom is hard.

Tides.—It is high water, full and change at noon; springs rise 7 feet. The strength of the stream is 2 to 3 knots at springs; vessels should moor, as the *Challenger*, at single anchor, surged very much at the night tides.

Southern entrance.—Kauit point is a tongue of sand which juts out about 9 cables to the north-east from the coast, with rocks at its sides, and trees and a ruined castle on it. At high water it appears as a low islet, and is not distinguishable until close-to. The castle lies S.W. 1¾ miles from Sebu fort. Between point Kauit and point Lipata, which lies S.W. ½ W. 3 miles from point Kauit, the shore is sandy, with good holding ground at 3 cables from it, in 6 fathoms.

Campanario shoal, covered by 5 feet of water, lies half-way between Kauit castle and the eastern edge of Lipata bank; it is marked by a buoy. From it San Nicholas church bears N. 13° E., and Kauit castle N. 6° E., distant 9½ cables.

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* A Chinese picul equals 133⅓ lbs. avoirdupoids, or 60,452 kilogrammes; a Philippine picul equals 139,45 lbs. avoirdupoids, or 6,325 kilogrammes.

Lipata and **Narvaez banks.**—Lipata bank lies in the middle of the southern entrance to port Sebu, between the coast of Sebu and the reef off the S.W. point of Maktan island. It is of oval form 3 cables in extent, and uncovers at low water. A bank covered by 8 feet of water extends north and north-east, the outer edge of which is marked by buoys. Between Lipata bank and the coast of Sebu, is Narvaez bank, of coral, 2 cables long, covered by 5 feet of water; marked by a black buoy with a ball. Both these banks, as also the edge of the reef off Maktan island, are marked by fishing stakes, but as the stakes are being constantly shifted, too much confidence must not be placed in them as marks for the edge of the banks.

LIGHTS.—On Lipata bank a fixed *red* light is exhibited on a tripod elevated 26 feet above the sea, and visible in clear weather to a distance of 6 miles.

On Lanis point, the south-west point of Maktan island, a fixed *green* light is exhibited on a tripod elevated 26 feet above the sea, and visible to a distance of 6 miles.

Leading mark.—The dome of San Nicholas church bearing N. ¼ E. will lead in mid-channel between Lipata bank and the reef off Maktan. On this bearing the church is in line with the central apex of a triple-peaked hill 10 or 12 miles to the northward of the town.

Lipata point is flat and sandy; not far from it is a stone fort, and the town of Talisai. A reef projects about 6 cables south of the point, with 4½ fathoms at its end. This is about the position assigned to Lagundi West shoal, bearing S.W. by W. ¾ W. $1\frac{8}{10}$ miles from the centre of Lipata bank, and it is probably the same; but the name Lagundi does not appear on the Spanish chart. The shoal is covered by 2¾ fathoms and is marked by a buoy with staff and ball.

Lagundi shoal, having over it 2¾ fathoms, bears S.S.W. 1¼ miles from the centre of Lipata bank, and is marked by a buoy with staff and ball. Another small shoal of sand covered by 2¾ fathoms lies S.W. 1¼ miles from Lipata point.

Tambon shoal, having over it 4 fathoms, bears S.E. by E. ¼ E. 2⅓ miles from the centre of Lipata bank; it is marked by a buoy with staff and ball.

Directions for navigating from Jintotolo channel to Sebu.—From a position 2 miles south of Jintotolo a course of S. 62° W will lead 1½ miles clear of north Gigante and north of Tanguingui islet to midway between Malapascua and Chocolate islets, but allowance must be made for the set of the currents which varies according to the strength of the monsoon. In the day time Malapascua can be passed on either side, but at night it is advisable to pass to the eastward, giving a berth to the dangerous rock which extends about three-quarters of a mile off its south point. From Malapascua a course should be steered to pass between Capitancillo and Kalangaman islets; a S. $\frac{3}{4}$ W. course then leads to within 2 miles of Bagakai light, at the northern entrance to Port Sebu or, from Malapascua steer to pass between Capitancillo and the coast of Sebu, as the channel that separates them is clear and deep.

The narrowest part of the entrance to port Sebu is between Mandani point and the mole of Opon town in Maktan, and there the depth will lessen to 4½ fathoms. A vessel should keep on the Opon side to avoid the bank on the coast of Sebu. When the *Challenger* entered the port in 1875 the edges of the shoal were by no means readily distinguished, for muddy water extended right across the narrowest part of the channel.

Having passed the mole of Opon a vessel should steer, in daylight, for the point of the fort of Sebu; but at night, if obscure on a course S. 64° W. This course will clear the shoals of the north coast, keeping at the same time a distance of 2 miles from the shore of Maktan island, to the anchorage off Sebu.

To go out from the anchorage by the southern channel a S.W., course should be steered until the dome of the church of San Nicholas bears N. ¼ E., when a course S. ¼ W. leads through the fairway between Lipata bank and the reef of Maktan island. Having cleared the reef and Lipata bank a course S.S.W. ¼ W. can be steered to pass 4 miles west Kalibao island.

South-east coast.—From point Lipata to point Tinaan (W.S.W. 6 miles), the coast forms a bay in the centre of which is the town of Minglanilla, of 9,700 inhabitants; the entire bay is obstructed by shoals which extend to 1½ miles from the shore; the channels between these shoals, and between them and the coast, are less than 3 fathoms deep.

Naga is a large town of 12,000 inhabitants, with a handsome church. Steam vessels and coasting craft using the south entrance to or from the port of Sebu, make Naga the point of entrance and departure.

Anchorage, but of small extent may be obtained off Naga in 4 to 7 fathoms, but care must be taken to avoid a small sunken rock having over it 2¾ fathoms, with 9 fathoms within a boat's length.

Tinaan, or **Tuiaan anchorage,** about 1½ miles south-west of

Naga, in front of a small village without a church, is difficult to distinguish from seaward. It is formed by the coast and a shoal half a mile south-east of the village. This shoal is 6 cables long E.N.E. and W.S.W. and 2 cables wide ; its extremities and the points of the bay are marked by stakes. In the middle of the bay there is a depth of 11 fathoms, sand, lessening gradually to 2¾ fathoms at one cable from the wharf. The north entrance is easier and cleaner than the south entrance, in the middle of which there is a patch of 5½ fathoms. Tuiaan is the port of shipment of coal from the mines of Uling and Alpako.

Coast.—From Tuiaan to the salient point of Argao, the coast is fringed by a narrow reef which extends from it no more than 2 cables at the most ; it is very steep with more than 50 fathoms depth at a short distance from it.. In passing along this part of the coast of Sebu it is advisable not to keep too near the land.

San Fernando is a town situated some distance inland from the coast, and about 3 miles S.W. of Tinaan.

Karkat point and **bay.**—The point is low and fringed by the coast reef of 2 cables' width with 20 to 40 fathoms near it. The bay has an islet in the middle of it, which, with the shoals projecting from the shore forms a little sheltered port. The church at Karkat is situated conspicuously on a hill N.N.W. of the islet, and the town contains 30,000 inhabitants. The entrance channel to the port runs N.W. and S.E., and has a depth of 4½ to 6½ fathoms. Within the port there are 7 fathoms. The best anchorage is near the north part of the islet. An acquaintance with the locality is necessary to enter, as the sides of the entrance are not marked by bushes. The shores are very low and covered by mangroves.

Sibonga, 4 miles to the south of Karkat bay, offers good anchorage sheltered from westerly winds, and may be known by a church lately constructed. The anchorage is in 4 fathoms, sand, at equal distance from the court-house and the church ; northward of this position the bottom becomes rocky, as also the coast as far as Karkat bay. The town of Sibonga contains about 14,000 inhabitants.

Argao point, 8 miles south of Sibonga offers anchorage in from 4 to 7 fathoms, sand, sheltered from north and north-east winds. Small vessels load here in both monsoons, choosing their anchorage north or south of the point as most convenient. The church at Argao is a most conspicuous building. Supplies may be obtained at Argao by applying to the local authorities ; the town numbers 26,400 inhabitants.

Point Dalaguete, 9 miles S.W.W. ¾ W. of point Argao is flat and sandy, clear and steep-to. Anchorage may be obtained north or south of the point in 3½ or 18 fathoms, sand. The town of Dalaguete contains 16,200 inhabitants, and may be known by a conspicuous church visible at a great distance, both from the north and from the south. The coast between points Argao and Dalaguete, consists in some places of clean and steep sand beaches, and in others of mangrove patches with shoals extending to a distance of one cable from the shore.

Tides.—The flood stream from the eastward strikes the coast about this part of Sebu, and is divided into two streams which follow the coast—one to the N.N.E. through the channels on either side of Maktan island, the other to the S.S.W. passes round to the south end of Sebu, and enters Tañon strait. The course of these tides will be fully described further on (p. 267).

The coast from Dalaguete point to Boljon is low, with steep sand beaches interrupted by rocky bluffs; at mid-distance are the town and shoal of Mambagi; the shore before the town is clean and a depth of 12 fathoms off it.

Mambagi shoal is a shoal of sand and rock one-third of a mile long, and a little more than a cable wide, with 3½ to 11 fathoms round its edges. It lies 2 miles off the coast and 2⅓ miles N.E. by N. of Boljon bluff.

Boljon bay is small and very steep; there are 12 fathoms within 100 yards of the shore; a little to the north of the bay is a white peaked rock of a good height (Boljon bluff), on which is a little stone tower, used as a signal station. The town of Boljon is surrounded by a wall and fortifications.

Point Yuisan, 4½ miles south of Boljon is low and ends in sand and rocks close to the shore; the village only contains 350 persons.

Yuisan shoal, of sand and rock awash at low water, with 2¼ to 5½ fathoms rounds its edge, is 2 cables long N.E. and S.W., and 1½ cables wide. It lies 1½ miles off shore. From it, Yuisan church bears N. 21° E. and the north point of Sikijor point S. 33° E.

Point Oslob, bearing S.W. by S. 4 miles from point Yuisan, is sandy and low, and has on it a fort of white stone, visible a great distance. It is surrounded by a narrow reef of only a cable's width. On the south side there is anchorage in 3½ to 9 fathoms. The town of Oslob numbers about 8,000 inhabitants. The coast between points Yuisan and Oslob is sand beach fringed by a reef a quarter of a mile wide, steep-to. From point Oslob to point Tañon which lies S.W. 8½ miles from it, the coast land is high, with sandy beaches and rugged bluffs of white rock, and is very steep.

Point Tañon, the southern point of Sebu island, is low, sandy, and surrounded by a narrow reef, little more than a cable wide. There is anchorage south of the point in 5½ to 7 fathoms, sand ; but it is exposed to the force of the tide streams that enter and leave the strait of Tañon. The church and town of Tañon are on high ground near the point.

Sumilon island lies E.N.E. 3 miles from point Tañon, and 1½ miles off the coast. It is two-thirds of a mile long, and 177 feet high ; its shores are clean and steep.

BOHUL ISLAND is of oval figure, 47 miles in length N.E. and S.W. and 34 miles wide N. and S. ; the southern part is hilly and and rocky, but the northern part has good tracts of level ground. The height is about the same as that of Sebu, the culminating point being mount Kopton, near the N.E. extremity ; its height, 10,150 feet in the Derrotero, but 2,870 on the chart. The coasts of the island are bordered by reefs, which on the northern side extend from the N.E. to the S.W. of the island at a distance of 12 miles.

The productions of the island are cacao, tobacco, cotton, Manila hemp, rice, maize, and sugar-cane ; and its forests furnish excellent wood. The district of Bohul includes the island of Sikijor and Panglas, and numbers 259,000 inhabitants ; the seat of government is Tagbilaran on the S.W. coast.

Lapinin island, on the N.E. extremity of Bohul island, is separated from it by a narrow channel 3½ to 7 fathoms deep. It is 8 miles long, flat, and covered by brambles. A narrow, steep coral reef surrounds it. The islet Tinuibo, lying S.E. by S., 2½ miles from the northern point of Lapinin island, is small, clean, and steep-to. Between the islands there are 12 fathoms water.

Danajon bank forms the outer limit of the coral reef that borders the north coast of Bohul, which is composed of a great number of shoals and islands, between which only small vessels with a good local pilot can navigate, and a description of which would be long and diffuse. The eastern end of the bank, sometimes called Adam and Eve bank, lies 10 miles N.E. ¼ E. from the north point of Lapinin island, and 2 miles from the coast of Leite.

The bank has two openings through it : the northern one is in a line between mount Kopton in Bohul, and mount Three Peaks in

Poro island (Kamotes); and the north-western one lies N. 60° W. of mount Corte; both of these openings have a width of about a mile, and a depth of 8 fathoms. On the bank, at great intervals. there are small islands covered by bushes and mangroves.

Channel between Bohul and Leite.—Kanigao island, which divides the channel between Danajon bank and the coast of Leite into two passages, lies 1½ miles from the coast of Leite; it is half a mile long, and is surrounded by a shoal which extends 2 miles to the south coast of the island, with a width of three-quarters of a mile at the northern part. Of the two passages the eastern, between Kanigao and Leite, is the better; it is about three-quarters of a mile wide, and has 7 fathoms at low water in mid-channel. The western passage is wider, but has only 4½ to 7 fathoms water, and the limits of the bank, Adam and Eve, are not well determined.

Adam and Eve bank.—This rocky patch, upon which there is a depth of 11 feet, with 3 fathoms around, lies with the centre of Kanigao bearing N. 86° E., and the centre of Tinuibo island bearing S. 23° W.

Olango island, situated N.W. of Bohul is low and flat; 4½ miles long N.E. and S.W., and 2 miles wide at its southern part, which is the widest. A steep reef surrounds it, extending half a mile from the eastern and western shores, and 4 miles to the S.W., with several islets on it. The channel which this island forms with Maktan is 1½ miles wide—deep and safe—and is often used in preference to Sebu strait. The channel east of Olango, between that island and Danajon reef, is also practicable and deep—it is 2 miles wide.

Malikabok and **Bagambanua islands.**—These little islands, which lie 7 miles off the coast of Bohul, may be said, with their surrounding reefs, to terminate to the S.W., the great Danajon bank, from which Malikabok is separated by a channel a mile wide, and very deep. A detached shoal with 2½ fathoms on its western edge, lies S.W. 2 miles off Bagambanua, and between these islands and the coast of Bohul are numerous islets and shoals, which will not be described—their positions are best seen by reference to the chart.

SOUTH-WEST COAST of BOHUL.—**Kalape island,** lying near the coast, is of no great height; it is foul and surrounded by a steep reef. The little port of Kalape, the entrance to which is very difficult and very dangerous, is between the island and the coast.

Kabilao island, separated from the coast islands Kalape and Sandingan by a wide and deep channel, is 2½ miles long east and west, and 1½ miles wide. On the S.W. side it has a small reef; the western side is rocky, rugged, and steep; the northern and eastern sides present sand beaches and rocky bluffs.

Tides.—The flood stream makes to the northward and the ebb to the southward with great force.

Laon point and **town,** or the point of the mole, is terminated by a sand beach, on which is a rampart; it is foul and surrounded by great detached rocks. The mole is 328 yards long, and the town is reached by steps cut in the rock. Between this mole and Sandingan island is a little bay, where shelter may be had from north to S.E., through east, in 3½ to 9 fathoms, mud. The town, of 15,300 inhabitants, is situated on the western slope of the Kanmanok hills at a good height, and presents from the sea a very picturesque aspect; it is defended by a fort with bastions at the angles.

Point Cruz, 4½ miles south of point Laon is of no great height, rocky and underworn, and presents the appearance of a wall. A ledge extends to 2 cables from it with 11 fathoms at the edge, offering bad anchorage.

Maribojo bay, in the elbow which the coast forms east of point Cruz, is foul, and lined by a steep reef extending three-quarters of a mile before the river Abalan, and continuing along the coast, joins the reef of Panglao island. The town of Maribogo, in the centre of the bay, is on ground of slight elevation, and numbers 16,500 inhabitants.

Shoal.—At 3 miles south-east of point Cruz and at one mile from the coast there is a small shoal of 33 yards extent surrounded by 9 fathoms, and with 27 to 36 fathoms at a cable's distance.

River Abalan.—The mouth of this river is of good width and there are 5½ feet on the bar at low water; the bar is generally marked by stakes. The north point is flat, and covered by mangroves, and has a reef off it; the south point has a little rocky islet off it, covered by mangroves. The town of Paminuitan, on a little hill near the sea, contains 7,500 inhabitants.

PANGLAO ISLAND is low and flat, having only one little hill on it; it is almost joined to Bohul island, as the channel that separates them dries at low water; a reef extends off it 4 miles to the south-west. There is no anchorage off the island. Point Duljo is sandy and flat, and may be recognised at a distance by a group of coco-nut palms on it; it is clean and steep. The reef on the north side is also steep. Point Bolud is flat and sandy, with a fort upon it. Point Bikin is steep with a flat crown.

Balikasai island, bearing S.S.W. 3½ miles from point Duljo is small, flat, clean, and steep-to. The channel between it and Panglao island is deep, no bottom being found in it with 110 fathoms. In taking this channel it is better to keep near Balikasai.

Cervera rock is 2 cables long N.E. and S.W. and has 13 feet, coral and sand, on its shallowest part. It can be distinguished in daylight by the colour of the water. From the rock, point Tahuruk (Panglao island) bears N. 60° W.; the mount, north-east of Panglao, N. 4° E.; and the south extreme of Pamilakan island, N. 82° E.

Pamilakan island, lying S. 80° E. of the south point of Panglao, is of no great height, and its coast is foul. The natives of Bohul resort to it to fish bêche de mer and turtle.

Tagbilaran strait is of little importance, as it can only be navigated by vessels drawing less than 6 feet. The entrance is from westward, and is generally marked by stakes. The town of Tagbilaran contains about 11,000 inhabitants, engaged in agriculture and turtle fishing.

The SOUTH COAST of BOHUL is very steep, and may be approached with safety, as the reef that fringes it is very narrow and very steep, but the little bays at the mouth of the rivers on this coast afford no good anchorage. The reef that borders the south coast continues round the bay of Guindulman, and is very steep; to the westward of some islets and rocks at the head of the bay there are 3 fathoms water, and 23 at a very little distance from the shore. The towns of Loai, Dimiao, and Guindulman contain 8,000 to 9,000 persons in each. From point Napakao, to the point off mount Pugatin the coast appears clear and steep.

EAST COAST.—Kobton bay, to the northward of mount Pugatin, is filled by a reef which leaves only a narrow opening 5 cables wide between the islets Lumittis and Tabon. This reef, which begins a mile to the southward of point Namanuko, continues to the northward as far as Lapinin island, bordering the coast at a short distance from it; the edge is steep, with soundings of 5½ to 9 fathoms near it.

Shoals.—A circular shoal of sand and rock, little more than a mile in diameter, and covered by 1¾ fathoms water lies 7 miles north of Namanuko; close to its eastern edge there are 37 fathoms. A small circular shoal, with 11 fathoms on its eastern edge, also lies S.E. of Tintimin islet, and N. 30° E., distant 1½ miles from the point between Tintimin islet and point Libal. A third small steep shoal is situated in the little bay, south of Tintimin.

SIKIJOR ISLAND is not very high; its surface is very broken, and rises to a central peak. Mount Kudtingun, which is N.E. of the central peak is 1,394 feet high. The island is 14½ miles long, and 11 miles wide. The productions are tobacco of superior quality, rice and maize, though hardly sufficient for consumption, manila hemp, and good cacao, which they barter for wax. The population is about 20,000.

Point Sandugan.—The northern part of the island is very low, and surrounded by a reef of one cable width. A conspicuous little hill lies to the south of it, and serves to mark it. The coast from point Sandugan to port Kanoan, 3 miles to the south, is very foul and steep near the shoals.

Port Kanoan[*] is very small, and is the only port of refuge in the island. The total depth of the port is 6 cables, but a sand flat at the head which dries at low-water reduces the available part of it to 4 cables. From the northern point of entrance a reef extends 1⅓ cables to the westward, with 4½ fathoms at its edge, and skirts the north side of the port; the southern entrance point, and south side of the bay are bordered by a reef a third of a cable wide. The soundings at the entrance are 14 fathoms, lessening to 3½ fathoms off the mole. The town, which is on the south side, contains 6,800 people.

Tides.—Off point Sandugan the tidal streams are very strong; the flood tide runs to the west, and the ebb to the east; but on the N.W. coast of Sikijor there is an eddy tide in the contrary direction, which does not extend to 2 miles off shore.

Points Tongo and **Pasigajon** are low, and surrounded by a reef which advances in some places as much as a mile from the shore. This reef is difficult to see, and is dangerous to approach, for soundings show no bottom with 110 fathoms at a cable's distance. The coast should not be closed within 2 or three miles. Point Makapilai is clean and peaked. With the exception of this reef on the west coast, the shores are clean and steep-to. On the south side the water is reported to be very deep near the shore, but no soundings are shown on the chart. Lasi bay is clear but deep; Minalunan bay is almost closed by a reef.

Shoal.—Off the north-east coast, 2 miles north of point Dakit, there is a small bank of rock, covered by 3½ fathoms,[†] with very deep water around it. From this shoal Mount Kudtingun bears S. 66° W., and point Lumango N. 58° W.

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[*] *See* Admiralty plan :—Ports in the Philippines No. 949; scale, m = 7·48 inches.

[†] Shown on the chart as having less than 6 feet.

CURRENTS.—In the eastern parts of the Sebu sea, between the south point of Panaon island and the north point of Kamiguin island, there is a constant current to the westward in both monsoons with varying velocity. Vessels approaching Surigao strait from the westward should keep well over towards Panaon island to avoid being swept by the current towards Kamiguin island.

In the southern part of the sea, on the north coast of Mindanao, there appears to be hardly any tidal stream, and the currents follow the direction of the wind in both monsoons.

There appears to be a constant current to the southward between Sebu and Bohul islands, and between Negros and Sikijor. When the *Challenger* was at Sebu it was noticed that the ebb, or south-going stream, immediately following the moon's superior transit, ran with far greater strength than either of the other two tides; its velocity at its greatest strength was 2 miles an hour. On leaving Sebu a current of 2 miles an hour was experienced. This current would appear to be by no means uncommon during the north-east monsoon, for Captain Riches of the British ship *Glamorganshire*, who happened to be at Sebu at the time of the *Challenger's* visit, and who has had much experience amongst the Philippine islands, said that he had always failed in attempting to work to the northward in this channel. On one occasion he struggled against wind and current for six days without making a mile, and eventually bore up and went round Negros and Panay islands, and came to Sebu from the northward in four days from the south end of Bohul. In March 1884 the German barque *Jupiter* left Iloilo for Sebu, and endeavoured to pass west of Sikijor, but had to bear up and work up on the east side. It would be better for sailing ships to work up on the north coast of Mindanao, and make Bohul east of Sikijor island.

Tidal streams.—The current produced by the tidal wave that enters by the strait of Surigao and passes between the islands Panglao and Sikijor divides into two branches. The northernmost flows to the north-west and strikes against the south-east coast of Sebu, about point Dalaguete, spreading its waters north and S.S.W. along the coast, so that a vessel off point Dalaguete has the flood favourable for going to Sebu, or to enter the strait of Tañon. The stream that flows N.N.E. passes through the channels between Sebu and Bohul, and concludes its course 5 or 6 miles south of the Kamotes islands, where it meets the opposite flood tide coming south between the northern part of Sebu and Leite. The ebb tide sets in the reverse direction.

The second branch flows to the westward, and striking the coast of Negros off Dumaguete divides into two other arms, one of which enters the strait of Tañon with great force, while the other turns south between Sikijor and the coast of Negros until, off point Bombonon, it meets the flood entering from the Sulu sea, and the united waters take a south-easterly direction towards points Silla and Tagolo in Mindanao.

LEITE.—The island of Leite, one of the Bisayas, is generally mountainous, but it contains however several large and fruitful valleys. The prevailing geological formation is volcanic, and several of the mountains are the extinct craters of volcanos, in which are found sulphur and other products of volcanic action; gold and iron ore are also found in the island. The mountains are covered with forest, among the trees of which is that which yields *damar*, the *brea* or pitch of the Spaniards, for the production of which Leite is the most remarkable of the whole Philippines.

The climate of Leite, though hot, is healthy; hurricanes occur, and inflict great damage to the coco-nut trees. The rivers are small and unfit for navigation, but extensively applied to irrigation. The chief productions are *abaca* (manila hemp), cotton, rice, and sugar cane, and the principal industry is the extraction of coco-nut oil. The population in 1879 amounted to 220,000 Bisayans. The capital, Takloban, is on the eastern coast near the southern entrance of the strait of San Juanico, that separates Leite island from Samar.

THE WEST COAST of LEITE is in general safe and steep-to; the fringing reefs do not extend more than a mile from the shore; a chain of high mountains runs parallel to the coast at a distance of 4 to 5 miles inland. The highest peak of the range appears to be mount Sacripante (3,911 feet), in the S.W. part of the island.

Gigantangan island, off the N.W. point of Leite, is 2 miles long N.N.E. and S.S.W., and one mile wide, and is clean on all sides except the south point, where there is a small reef. The channel that separates it from Leite is one mile wide and 11 to 16 fathoms deep.

Tabin Chico and Tabin Grande are two small bays separated by a tongue of land; their depth is 7 to 11 fathoms. Tabango and Kampopo bays, separated by point Ligliq, are larger than the

Tabines, and appear to be deeper. The narrow reef that fringes this part of the coast follows the contour of these four bays.

Port Palompon* is formed by a narrow channel between the coast south of point Kanaguayan and the reef on which is situated the island Tabok; the only entrance is to the northward between the point and the island, the southern end of the channel being closed by low reefs covered by mangroves.

Point Kanaguayan is bordered by a reef to the distance of 1½ cables, and the reef of Tapok island extends 1½ miles W.N.W., reducing between them the width of the passage to 2 cables, with a depth of 19 fathoms; proceeding inwards, the passage becomes narrower and shoals gradually, so that in front of the church, where is the best anchorage, it is hardly a cable wide, with a depth of 7 fathoms. Anchorage can also be had close to the sandy point, alongside which vessels of any size can lie secured to the shore. From this point the depth diminishes gradually to the southward, and off Gumalak island is only 2¾ fathoms. The reefs show at low water, and the edges are marked by poles with bushes on them, but these must not be relied on.

The town of Palompon is on the shore of the port, and numbers 7,800 inhabitants. Supplies of beef and vegetables may be obtained also fresh water. In the town of Palompon, as in other of the towns of the Philippine islands, a tariff of prices is hung up in the Casa Real for the guidance of strangers, who can claim to be supplied for ten days at the prices quoted.

Directions.—To make the port of Palompon the island Kalangaman should be brought to bear N. 64° W., when a course S. 64° E. will lead for the entrance.

Coast.—The reef that surrounds Tabok and Gumalak islands and fringes the shore to a distance of 1½ miles, and continues to the southward, round point Duljugan where it is half a mile wide to port Dupon, which lies 2 miles to the eastward of the point. Point Duljugan is low and thinly wooded; the south-western point of port Dupon is somewhat higher and has a little fort on it.

Port Dupon has a depth of 38 fathoms in the centre; the best anchorage is on the western side of the port where the shore is less steep than on the east side and there is more shelter; on the east side of the port the bottom consists of coral, and anchorage is considered very unsafe.

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* *See* Admiralty plan, Ports in the Philippines, No. 957; scale, *m* =3·1 inches.

The little bay of Siapon,* 1½ miles to the eastward, is sheltered from all winds, but those from south to south-east; the depth at the entrance is 15 fathoms, lessening gradually inwards. The low point between the two bays can be distinguished by a patch of *cogonal* on it. Water can be obtained in both bays.

Kalunangan point is low, flat, and bordered by a narrow reef. Anchorage can be had on the coast between point Kalunangan and point Biason in 9 fathoms, coarse sand.

OKMOK BAY.—To the eastward of point Kalunangan the coast forms the great bay of Okmok, in the north-west part of which is port Bello with anchorage in 2¾ to 9 fathoms, mud. This is the only safe anchorage on the south coast of Leite island during the generality of typhoons.†

Jaloban river is a good sized river with 5 feet water on the bar at low water and deeper water within. From the eastern bank of the river a clean sandy beach with good depth off it stretches 1½ miles to the south-east as far as the town of Okmok.

Okmok is a town of 11,200 inhabitants situated near the shore and on the slope of mount Aslum ; it is surrounded by a breastwork of stone with three ruined forts.

Peaks of Aslum and Kampukan.—Mount Aslum rises to a high and remarkable peak, N.E. by E. 4½ miles from Okmok town. Kampukan peak, 2 miles N.E. of Aslum peak, is much higher and more conical than that of Aslum. Both mountains abound in sulphur and copperas.

Coast.—From Okmok to Baibai, a town of 7,000 inhabitants, lying about 23 miles to the south-eastward of Okmok, the shore is low and consists of steep sand beach with generally soundings of 14 to 18 fathoms very close to it. From Baibai to Ilongos, 19 miles to the southward, the coast forms rocky headlands alternately with small clean and steep bays.

KAMOTES ISLANDS.—This group consists of three islands connected by a reef, and one small detached islet, Tulang. The westernmost island, Pasijan, is 8½ miles long, north and south, and nearly 5 miles wide, and is clean and steep-to all round except that part of the eastern side where a reef that nearly dries at low water joins it to Poro island. Tulang island, off the north-west part appears clean and steep.

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* Not named on chart.

† Information given by Mr. Loney, R.N.

Poro island is surrounded on all sides except the north-western by a reef of less than half a mile in width, the channel between Poro and Poson has a depth of 5 to 7 fathoms, and is practicable for navigation. The town of Poro is on the south side of the island; and anchorage may be had off the town at the distance of half a mile; but caution must be observed in approaching, as shallows, that dry at low water, run out a long distance.

Poson, the northernmost of the group lies 5½ miles S.S.E. of point Kalunangan; the channel between is clear and deep, but care must be taken not to approach the shore off Poson as a reef extends to the northward of it about one mile.

Tides.—The flood stream from the northward passes from west to east in the channel between Poson island and Kalunangan point and curves round the island to the southward. The flood stream from the southward which has entered by Surigao strait, meets the flood stream from the northward about 5 miles south of Kamotes.

Cuatro isles. (Four islands) is the name given to a group of four islets lying 3 miles off the coast of Leite; the southernmost of them, Jimukitan bears W.N.W. about 4 miles from a little steep hill with a flat crown on the coast 6 miles north of Ilongos; this islet and the one 3 miles north-west of it (Majabas) are clear and steep-to, the two others are surrounded by reefs. The passages between these islets and between them and the coast are safe.

COAST.—From Ilongos the coast forms an elbow which measures 2½ miles across to the town of Bato and then continues to the southward for 11½ miles to the point Green hill, opposite Lapinin isle near Bohol.

Shoal.—Off the village of Makalon, 2½ miles south of Bato, is a shoal, having over it from 2½ to 5 fathoms; it is generally marked by bushes.*

From Green hill the coast trends eastward for nearly 6 miles to the town of Masin, and then turns S.E. ½ E. for 13 miles to point Tuankan (or Ninipo) the south extremity of the island of Leite. All this part of the coast is formed of rocky points and small sand beaches; and is clean and steep-to except before the town of Masin, and also around point Tuankan.

Masin is a town of 9,300 inhabitants, situated on a sand beach from which a ledge projects some 2 or 3 cables and dries at low water; a channel of 2¾ fathoms leads to the town. There is anchorage on a bank of small extent in 7 to 14 fathoms, sand, with the church bearing N.W.

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* Information given by Mr. Loney.

Point Tuankan is low, and is formed of rock underworn by currents, giving it the appearance of a rampart. It is surrounded by a narrow steep reef with 4½ to 9 fathoms at the edges, and no bottom with 92 fathoms line at one cable distance.

Limasana island, situated 2 miles to the S.E. of the southern point of Leite, is 4½ miles north and south, and one wide, and has a remarkable hill on its northern part. The island is clean, and on its south-east part there is a sandy beach, where anchorage can be had in 2¾ fathoms at one cable from the shore. The channel between Limasana island and point Tuankan is safe.

Tides.—The tidal streams run with great force here, the flood stream to the N.W. and the ebb to the S.E.

PANAON ISLAND, separated from the south-east point of Leite by a narrow channel, is 17½ miles long N.N.W. and S.S.E., and 5 miles wide at its northern part. The island is mountainous and is divided throughout its length by a range of hills terminating to the south in a mountain 2,313 feet high, the slope of which forms the southern point of the island.

The eastern coast is high and rugged, and shows several cascades of excellent water. The western coast, though steep, presents several sand beaches, where anchorage may be had in 7 to 9 fathoms, sand, but it is better to anchor in the sheltered port of Liloan.

Port Liloan.—This port has two entrances. The eastern entrance is very narrow, the least depth in it is 2¾ fathoms, increasing to 4½ and 5½ fathoms in Panoan strait. The water in it is so clear that the bottom can be seen clearly. In order to enter the port from the eastward, steer for the narrow opening between Leite and Panoan island, which runs S. 73° W.; whilst a good distance off a group of coco-nut palms on point Liloan will be seen; the soundings increase on approaching the entrance; when 15 fathoms is obtained take the middle of the channel, which leads to the anchorage coasting the reef that ranges along the shore of the port until in front of the town then anchor in 5½ to 7 fathoms, sand.

To enter by the western passage.—The best mark to steer for is a little hill near point Liloan, with coco-nut palms and some houses on it, taking care to clear a little reef north-west of the entrance point, near which the depth is 26 fathoms, and closing as much as possible the sandy point of Panoan, and avoiding the coast of Leite, from which a reef projects 3½ miles to the south-west; between the southern edge of this reef and the sandy point of Liloan, which form the western entrance of the port, and which is 3½ cables wide, the depth is 7 to 9 fathoms, shells.

The shores of the port are sandy, and the town of Liloan is situated on a little plain. The population amounts to 6,000 people, engaged in agriculture, fishing, and gold washing.[*]

SURIGAO STRAIT.—Surigao strait is famous for having been traversed by Magellan when he crossed the Pacific Ocean and discovered the Philippine islands. The strait is now less frequented than that of San Bernardino, which is more to windward in the N.E. monsoon. It is, however, more direct and safer than that strait, but it obliges vessels that take it if they are making for Manila, to work up the west coast of Negros and Panay, and the east coast of Mindoro. It is of advantage to vessels going to the southern Philippines or to the Sulu sea.

The main strait is safe and deep throughout its length and the shores of the islands that border it are steep-to. Steamers from the Sebu sea making for ports on the east coast of Mindanao may find it advantageous to take the eastern passage between Dinagat and Bukas islands and the main coast of Mindanao. This channel will be described after the main strait.

SOUTH-EAST COAST OF LEITE.—From Panoan strait the coast trends north for 5½ miles, then turns abruptly to the ~~west~~ for another 5½ miles to Maragusa point, a rounded headland formed by the western slopes of Mount Kabalian, which is 3,130 feet high; the coast-line then continues north again for 8½ miles to Ginungagan bay. Throughout this entire length the coast is high and clean, with deep water in the vicinity, but it is exposed to the open sea.

Hinondayan bay is very small; an islet surrounded by rocks lies at the mouth; the depth of water in the passages on either side of the islet is 11 fathoms, and within it is 3½ fathoms.

Ginungagan bay has a depth of 15 fathoms in the middle, and 5½ off the town of the same name, which stands on the left bank of the river Malaga at the head of the bay. The two islands Kabugan lie in the northern part of the bay, separated from the main coast (which is sandy) by a channel one mile wide and 15 to 25 fathoms deep.

Jinatungan point lies 11 miles north of Ginungagan bay, and is bordered by a reef which extends half a mile out. A rocky islet and several rocks lie immediately south of the point at three-quarters of a mile's distance from the shore.

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[*] Horsburgh states, Vol. II., p. 518, that no ship should venture to pass through the strait of Panoan unless in a case of necessity, on account of the overwhelming tides.

Tai tai point, 10 miles N.W. of Jinatungan point, is also surrounded by a reef to a distance of half a mile. From the point the coast trends north for 30 miles to the southern entrance of San Juanico strait. All this tract of coast consists of sandy beaches with a good depth of water off them; there are many rivers, and several towns stand along the shore. The country inland is level and covered with dense wood, interrupted by coco-nut plantations and rice fields.

The south coast of Samar is described in Chapter IX.

NORTH-EAST COAST OF MINDANAO AND OFF-LYING ISLANDS.

Bilaa point, the northern extremity of Mindanao island, is the termination of the range of hills that runs along the eastern coast from north to south; the point itself is of dark rock, clean and steep-to.

A sand-bank of 1½ miles extent, covered by 2¾ fathoms, lies north three-quarters of a mile from point Bilaa, from which it is separated by a channel half a mile wide; this channel can be used by boats at high water. During the south-west monsoon anchorage can be found on the slope of this bank in 27 fathoms, sheltered from the tide stream.

Madilao point, which lies about S.W. 3 miles from Bilaa point, is high, clean, steep, and composed of dark rock; no bottom was found with 92 fathoms at one cable from it. It forms, with Bilaa point, a bay running about a mile in, which offers anchorage, sheltered from north-east to south-west through east. The coast, on the western side of Mindanao, as far south as the river Butuan, is little known, but it appears to be safe and steep; it consists of the western slopes of the two mountain ranges.

North-east coast.—From Bilaa point the coast trends E.S.E. for 4 miles to the river and town of Surigao, and consists of sand-beaches and rocky cliffs, clean and steep-to.

Surigao town,[*] the residence of the governor of the district, stands on the shore on the right bank of the river; it contains 4,100

See [illegible]ralty plan, Ports in the Philippines, Port Surigao, No. 962; scale, $m =$ [illegible] inhabitants engaged in collecting pearl shell and trepang, and in gold washing. If intending to anchor off the town, it should be brought to bear S. by W., and steered for on that bearing, and the anchor let go in 12 fathoms at one mile, or 1½ from the shore. It is better not to anchor further out, as the depth increases rapidly to 35 fathoms and more, and the tidal streams reach a velocity of 8 knots.

Earthquakes.*—On the 1st of July 1879, owing to a succession of earthquakes, the ground in the neighbourhood of Surigao and Bilambilam, in Mindanao island, sank two feet. In October 1879 pilots would not anchor vessels off the town of Surigao in less than 15 fathoms, and at that time all the government and most of the heavy buildings were uninhabitable.

Mails from Surigao to places on the east coast of Mindanao island are sent to Butuan, a town situated on a river of that name on the north-west coast, and thence across the mountains to their destination.

Tides.—The tides are affected by diurnal inequality, both as to time and height, in the same way as at Manila. The time of high water varies from day to day; it is, approximately, 9h. 30m.; the greatest range is 6½ feet, and the least 4½ feet.

Bilambilam anchorage.†—The little creek named Bilambilam port, lying one mile south of Surigao, is hardly capable of holding four small coasters; these anchor south of the point in 7 fathoms, but in the open bay to the eastward there is anchorage in 9 to 11 fathoms, sand, close to the reef which borders the mangrove-hidden shore.

Basol island, lying 3 miles N.E. by E. ½ E. of Bilaa point, is flat and bordered by a sand-beach; a reef surrounds the island, and extends to 4 cables to the south-west. Midway between Basol and the coast, the depth is 25 fathoms. The force of the tides is very strong in this channel, and forms violent eddies and whirls.

Onate rock lies 1½ miles N. 31° E. of Basol island and half a mile S. 63° W. of Belzibub rock. It is a pyramid of rock 10 yards in diameter, covered by 5 feet of water, and surrounded by great depths. From this rock the middle of Sumilon island bears N. 39° W., and Bilaa point S. 57° W.

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* These earthquakes may have caused alterations affecting the features as shown on the Admiralty plan No. 962, which should therefore be used with caution.

† *See* Admiralty plan, Ports in the Philippine islands, Port Surigao, No. 962; scale, $m = 1{\cdot}0$ inch.

Belzibub rock is a small steep coral bank. This rock and Onate divide the channel between Basol and Gipdo islands into two passages of equal width.

Sumilon island, 5½ north of Bilaa point, is small, low, and steep-to. The currents are more dangerous near this island than near Basol, and there is always an ocean swell.

Satan's rock, one mile N.E. of Sumilon is small and steep ; it may be approached close to on the east side.

Gipdo island off the S.W. point of Dinagat island, is 1,030 feet high, steep-to and clean on all sides except at its S.E. point from which a reef extends to a distance of half a mile.

Danaodanauan island, about one mile N.W. of Gipdo, is safe and steep-to ; a reef lies 1½ miles from its north shore.

The Kabilan islets are a group of four, occupying an area of half a mile in extent. A small sand-bank lies between these islets and Dinagat town.

The Unip group is composed of the islands Sibanag, Unip, Kabakian (Tabuiaka) and several islets. The southern and western sides of the group may be coasted at a short distance without danger.

DINAGAT ISLAND is 36½ miles long, north and south, and 12½ miles across its widest part. A chain of mountains traverses the island along the east coast. The northern peak, Mount Redondo, reaching the height of 3,337 feet. The coasts are in general bold and steep-to. On the western side of the south point there are two islands almost forming a part of the main island, being separated from it by a narrow channel only. A conical mountain, 1,060 feet in height, rises in the southernmost of these two islands. The town of Nonok is situated at the southern end of this island, and 2 miles south of this southern point there is a flat islet, surrounded by and connected with it by a rocky reef. This islet forms the northern side of the eastern passage of Surigao strait.

Sibale island is connected with the northern of the two islands by a reef, and is separated from Gipdo island by a narrow deep channel.

Gipdo passage, which separates Dinagat from the two islands to the south-west, is 1½ cables wide and 6 fathoms deep throughout its length. The southern entrance is at port Gabo, and the northern is about 3 miles south of Dinagat town ; about the middle of this distance another channel branches off from it to the W.S.W., separating the two islands.

Dinagat town, of 1,200 inhabitants, is built on a foul point on the south side of an unimportant creek which has a depth of 37 fathoms at the entrance. The main industry is the extraction of gold from a mine in the neighbourhood.

The West Coast of Dinagat from the islet Kubkub, which is clean and steep-to, runs north for 15 miles as far as point Esconchada, and can be coasted with safety ; about half-way lies the town of Liboho, in a creek of no importance, open to the north-west. The Pelotes rocks, which extend from the south point half-way across the entrance, are steep-to ; a clean and steep islet, not named on the chart, lies one mile south-west of the south point ; to the northward of Esconchada there are two bays, separated by point Berrugosa. The islets Twins lie 2 miles N.N.E. of point Berrugosa.

Gibuson island, 4 miles north-west of point Berrugosa, is 3 miles long, north-west and south-east, narrow, and of irregular shape, clean, and steep-to. It can be passed without danger at a distance of one mile.

Malinao port, on the east coast of Dinagat, 13 miles from the north point of the island, is a narrow little bay 2 miles deep, with 18 to 2½ fathoms depth of water. The entrance points are bordered by reefs ; the one surrounding the north point extends along the coast to the north for a distance of 4 miles.

Peñascales point, 10 miles south by east of Malinao port, is surrounded by rocks to half a mile's distance.

Port Gabó,* situated at the south end of Dinagat island, is well sheltered, being protected to the northward by the high mountain Caballete, and to the south by mount Lapa, on the island south-west of Dinagat. The port, which is easily made out from seaward, is 9 cables wide at the entrance, and has a good depth of water. It penetrates 1¼ miles to the westward, and then forms an elbow turning into the Gabo passage. The anchorage is at the elbow, at one cable's distance from the sand beach, and 3 cables from the islet joined to the southern shore, in 12 fathoms. Water can be procured on the north shore of the port.

Malhon island (Jomonjol), which lies 9½ miles from the south point of Samar, is a crescent-shaped island, 8 miles long, of moderate height, with a small islet, Mantuna, near the western point. In the bay on the north-east side there is a sand-beach with rocks on both sides of it, and a depth of 14 fathoms near. E.N.E. of this sand-beach, and towards Suluan island, there are rocky patches of 12 fathoms water, with 35 fathoms close to.

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* *See* Admiralty Plan, Ports in the Philippines, No. 962 ; scale, $m = 1{\cdot}96$ inches.

Suluan island, the Buena señal of Legaspi's expedition, 9 miles west of Malhon island, and 10½ miles S.E. ½ S. from the south point of Samar, is nearly a mile in length, of moderate height, and steep-to, with several rocks on its western side. Situated as it is to windward at the entrance of Surigao strait, it is a good point to make for entering the strait from the Pacific. Between Suluan and Malhon islands the depth is generally 12 fathoms, and between Suluan and the edge of the reef off the south point of Samar 16 to 23 fathoms, sand.

EASTERN or GINATUAN PASSAGE.—This narrow and tortuous passage is comprised between the north-east coast of Mindanao and the south points of the islands Dinagat and Bukas; although deep, it should not be taken without a pilot, on account of the strength of the currents and the tide-whirls met with off the south end of Dinagat. In case of necessity vessels can anchor at Surigao to await a favourable wind and tide.

Pilots may be obtained at Surigao; and should the vessel be bound for ports in the Pacific, they can be landed at Kantilan, which is a large village on the north-east coast of Mindanao, where supplies can be procured. Applications should be made to the captains of the Pueblos. In 1879 the charge for pilotage through Surigao strait was 30 dollars, but it is advisable to arrange terms for pilotage beforehand. Vessels entering Surigao strait from the eastward can pick up a pilot from Kantilan.

NORTH-EAST COAST of MINDANAO.—Surigao town and Bilambilam bay have already been described. From the east point of Bilambilam bay the coast trends almost S.E. by E. for 30 miles, forming a slight indentation, to point Tugus; the shore is covered by mangroves and strewn with rocks.

The Ginatuan islands extend to about 9 miles from the coast in a north-easterly direction, leaving a deep channel 2½ miles wide between them and the south coast of Dinagat. Ginatuan island, the largest of the group, is 3 miles long N.W. and S.E., and has a small islet off its northern point; both island and islet are clean and steep-to; Bayalnan (Bayatuan), the next island, to the south-east, is 3½ miles long N.W. and S.E.; a reef on its northern end extends one mile to the N.E., enclosing several rocks under water. The channel between Ginatuan and Bayalnan is 1½ miles wide; but some islets on the southern end reduce the available passage to a width of 4 cables. This channel is practicable for steamers, but the passages between the western islands of the group and the coast of Mindanao are not practicable. Kabsugan, the southernmost island, is 4½ miles long N.W. and S.E., and is united to the coast.

Nagubat islets are two rocks, clean and steep-to, lying 7 miles south of the summit of Ginatuan island.

Kabgan island lies 2½ miles south of Nagubat islets, and one mile from the coast of Mindanao. A group of four rocks lies 2½ miles S.E. of Kabgan.

Nangaba islands, close to Tagonito point, form a chain of eight islets extending 4½ miles W.N.W. and E.S.E. The southern islet Amagadpagat lies nearly in the middle of the channel between the coast and the south point of Bukas island.

Tugus point is a narrow tongue of land stretching 2 miles to the N.E. The channel between it and Bukas island is 4½ miles wide, and has a depth of 41 fathoms in the middle. The land in the vicinity is commanded by mount Legaspi, 3,889 feet high, at the northern end of the great range that runs parallel to the east coast of Mindanao.

Ballena (Whale rock), 6¾ miles east of Tugus point, when seen from the northward, appears like two rocks; it is 5 yards in extent and 5 feet above water; a reef extends half a mile S.W. of the rock.

General island is the largest and highest of a group consisting of three islands and several rocks lying off Kapunuipugan point, 5 miles S.E. of point Tugus. It is separated from the point by a deep and narrow channel, and is surrounded by a reef which shows several rocks above water, and includes Triton rocks and Anki islet 2 miles to the south-east. There is anchorage S.W. of the island near the shore in 17 fathoms, mud. Unamao, 2 miles south of the General, is united to the coast by a reef; between the two islands there is an isolated rocky shoal.

Kantilan reef, before the river and town of the same name 5 miles south of point Kapunuipugan, extends 2 miles from the shore, the end of the reef is in line with Unamao islet and point Kapunuipugan.

Kauit point, 20 miles S.E. by E. of Tugus point is clean and steep-to the northward and westward, but bordered to the eastward by a reef that reaches out for 1½ miles to seaward, and continues along the coast to the southward for 10 miles. The open bay between the general islands and Kauit point has not been sounded, but it appears to be clean and deep.

Tides.—The ebb stream from Surigao strait is said to follow round Kauit point to the southward.

BUKAS ISLANDS are three islands so close together as almost to form one island, but they are separated by narrow openings in the reefs that surround them. The southern island, or great Bukas, is irregular in outline, about 12 miles long north and south, and traversed throughout its length by a range of hills. Its coast on all sides, except the north-eastern where it is joined to the middle island, is clean. A shoal of white coral lies E. by N. of the north point of this island. There are soundings of 11 to 18 fathoms about one mile from the south-west coast, in the channel between the island and Tugus point.

The middle Bukas island is 3 miles across from north to south, and 2 miles from east to west, and is surrounded by a coral reef. A conical hill, 984 feet high, rises on the south-east part. The eastern island is 3 miles long east and west, and 1½ miles wide north and south, and is surrounded by a reef which projects 2 miles to the south-east, and incloses the islet Kasulian; the reef is steep-to and shows several rocky heads above water.

Sibonga port*, on the south side of the middle island at the foot of the conical hill, is divided into two narrow arms by an islet united to the south point of the island by a reef that borders the shore. The depth of water in the western arm is 9 to 18 fathoms, sand and rock; in the eastern arm it is 4½ to 9 fathoms. This latter arm communicates with port Castilla on the north side of the island by a channel 15 yards wide and 5 feet deep, which forms the separation between the middle and eastern island.

Port Castilla (not named on the chart), between the reefs on the north sides of middle and eastern Bukas islands, is open to the northward by a narrow passage between the reefs; it is a little oval-shaped port of 6 cables greatest diameter, and 3 cables across, with 8 fathoms depth.

Reef.—A narrow reef, extending 8 miles N.E. and S.W., which dries in places, lies 3 miles S.E. of eastern Bukas island. The northern extremity of it is separated from the south-east reef of Siargao island by a passage 1½ mile wide, and the southern extremity is separated from the east coast of the southern Bukas by a passage 2 miles wide. These passages, as also that between the reef and Kasulian islet, are safe and deep.

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* *See* Admiralty plan, Ports in the Philippines, No. 962; scale, $m = 1·96$ inches.

Lajanosa and Anajauan islands are two islands lying south of Siargáo island and east of the southern Bukas island. They are two miles apart, and surrounded by reefs; some rocks lie 1½ miles south of Lajanosa. The passage between Lajanosa and the reef south-east Siargáo is 4 miles wide, and 18 to 23 fathoms deep.

SIARGÁO ISLAND is irregular in outline, 19 miles long north and south, with 12 miles greatest width at the southern part, and is traversed throughout its length by a chain of mountains. The northern and north-western coast is surrounded by an extensive reef to a distance of 3 miles from the shore; and from the south-east part of the island another reef projects to a distance of 4 miles, enclosing the islets Guiang (Guinjang) and Dako. On the coasts there are a few towns and little ports entered by channels through the reefs. On the western coasts between ports Sapao and Kakut there is a group of low islands on a reef, and several rocks show at various points on the edge of the reef.

Port Pilar,[*] on the east coast of Siargáo, is a small circular port of 6 cables diameter, steep sided, with a large rock on the southern side united to the coast by a reef; the anchorage is west of this rock in 8 to 14 fathoms.

Dapa channel,[†] between Siargao and Bukas island, is safe and deep; its least width between the island off point Kambasak, the south point of Siargáo, and the north coast of east Bukas, is one cable; the reefs on both sides are distinctly visible.

Kiko and Barrabas shoals lie in the middle of the western entrance. The first is one cable, and the other 1½ cables in diameter; they are steep-to and can be passed on either side. The reef off the north point of great Bukas island has already been mentioned.

Dapa reef extends to 1½ miles E. by S. from Kambasak point. On the reef and close to the point there is an island 6 cables long; an opening in the reef, 3 to 5½ fathoms deep, leads to the anchorage of Dapa. A detached bank surrounded by deep water lies 2½ cables east of Dapa reef.

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[*] There is a Spanish plan of the port, published in 1864.

[†] *See* Spanish plan. Silanga de Dapa. No. 145, published in 1865.

Dapa anchorage is in a narrow channel between the northern edge of Dapa reef and the shore reef of Siargáo; it has a depth of 3½ fathoms before the town of Dapa, an unimportant town of 1,200 inhabitants. Neither pilots nor supplies are obtainable. The inlet north-west of Dapa is obstructed by reefs, and only fit for boat navigation.

Port Kakub, on the south-west coast of Siargáo is only half a cable wide at the entrance, and 3½ to 12 fathoms deep. There is anchorage before the entrance in 7 fathoms. The coast between Dapa inlet and Kakub is a mass of rock, dry at low water.

Port Sapao, on the north-west coast, is formed by an opening in the reef and is of no importance.

Jalian island, 5½ miles N. 60° E. of port Gabó in Dinagat island, is surrounded by a reef which extends 2 miles to the E.N.E.; the eastern edge of this reef is 2½ miles distant from the western edge of the N.W. reef of Siargáo.

TIDES.—In port Kakub there are two high tides and two low tides in each lunar day. The height of the tide is affected by diurnal inequality, which varies with the moon's declination. In the summer the day tide is the highest and in the winter the night-tide. It is high water, full and change, at 6h. 22m. The greatest range is 7 feet and the least is 5 feet.

Tidal streams.—In Surigáo strait the flood tide sets to the west, and the ebb to the east, the latter following round point Kauit then runs to the southward.

The velocity of the stream in the strait reaches 6 knots at springs. There is a difference of about 2 hours between the time of high water at Surigáo and in Surigáo strait. Fishermen roughly estimate that when the moon rises the ebb tide commences to run in Surigáo strait. From January to June there is but one high water during the twenty-four hours in Surigáo strait, which occurs during the night. From July to December the same phenomenon takes place, but the time of high water is by day.

From observations made by the Spanish surveyors, it appears that the highest tide on the west coast of the islands of the strait takes place at the same hour as the lowest tide on the east coasts. This phenomenon is especially marked at the little island Kabsugan, S.E. of Ginatuan, the inhabitants of which live by shell-fishing, and when the ~~banks of the east coast begin to cover they pass to the~~ west coast, where the tide begins to fall, and continue their fishing.

Eddies.—Between points Surigáo and Bilaa a counter current prevails, contrary to the tidal stream in the strait, and between the coast of Mindanao and the islands Dinagat and Siargáo a number of eddies prevail in different directions. The pilots of the locality avail themselves of these eddies in navigation.

Winds in Surigáo strait.—At the mouth of the strait the N.E. monsoon commences towards the end of September, and blows throughout October and November; in December N.E. winds alternate with northerly gales. In January winds blow from N.E. and E.N.E. accompanied by heavy rain. In February and March easterly winds prevail. In April, May, and June the prevailing wind is S.E. with occasional gales called *collas* from the south. In July, August, and September *collas* from S.W. are frequent.

The N.E. winds, though strong, cease during the night; but winds from the S.E., south, and S.W. continue to blow. It generally rains with N.N.E. and E.N.E. winds; the rain ceases and the weather clears with east winds, and more so with S.E. winds. With S.W. winds it remains clear unless a gale arises which sometimes brings rain.

In general there is no very bad weather in this part of the Archipelago, except when a typhoon occurs. The season of the year when typhoons mostly occur is from the end of October to the beginning of January, principally at springs and at the quarterings of the moon, it is said. They begin to blow from N.W., and finish from the S.E., having passed through N.E. or S.W.; when they veer through N.E. they blow stronger, and more rain falls.

According to Maqueda, in the year 1775 three typhoons occurred in Surigáo strait, and two in 1781, at the crescent and full moon. None have been observed since that time, whilst in the mouth of San Bernardino strait, and the coast of Luzon several very severe typhoons have been recorded.

DIRECTIONS for the EASTERN PASSAGE.—The eastern passage between the N.E. coast of Mindanao and the islands of Dinagat and Siargáo is difficult, and should not be taken by a sailing-vessel unless she has the wind and tide in her favour. A pilot should be employed, and the route taken should be as follows: Having made Bilaa point a vessel can either pass outside the $2\frac{3}{4}$-fathoms shoal north of the point, or between it and the point; and she should keep in mid-channel between Basol island and the coast of Mindanao. When one mile south of Basol, she should steer

S. 70° E. to pass one mile from the rocks that surround Rasa islet off the south point of Nonok; then steering E.N.E. she should pass between Ginatuan island and port Gabo, rather approaching the Dinagat shore which is steep-to, and she will be less exposed to the tidal streams and eddies which are very violent in this passage. Ginatuan island should be rounded at a safe distance, and when one mile east of the eastern point of the island a course S. 38° E. should be steered for the middle of the channel between Bukas island and Mindanao, leaving Amadgadpagat islet one mile to starboard; having passed through the channel she can steer east into the Pacific.

A steamer can pass between Ginatuan and Bayalnan islands, taking care to avoid the reef off the north point of the last named island, and leaving to starboard the islet which lies half a mile south of the south-west point of Ginatuan. A course S. 49° E. will then lead to the middle of the channel between Bukas and Mindanao.

MINDANAO ISLAND.—This island, next to Luzon is the largest of the Philippines. The coast line is very uneven, and is much indented with deep bays and inlets, those of Iligan on the north, and Illana or Lanun on the south, leaving an isthmus between them little more than 30 miles wide. The island is drained chiefly by two rivers, the Rio grande de Mindanao, which enters the sea by an extensive delta at Kota Batu in the southern part of Illana bay, and which drains an extensive plain with several large lakes; and the river Butuan, the mouth of which is in Butuan bay on the north, while it rises not far from the head of Davao bay on the south.

The whole island of Mindanao being less than ten degrees from the equator, its climate is hot and humid, and more equable than that of Luzon. It is under the influence of the monsoons of the northern hemisphere, but beyond the region of typhoons. It has all the products of the other islands of the Archipelago, and in addition cinnamon, nutmegs, pepper, and a great variety of timber. Gold dust is found in the sands of the rivers.

Butuan bay.—The southern shore of this bay, between the river Butuan which enters the eastern angle, and the town Nasipit 13 miles to the westward, is low, covered by mangroves, and bordered by shoal water to a very short distance from it. From Nasipit to point Diuata, 8 miles to the N.N.W. the shore is fringed by a reef which extends out half a mile.

Butuan river is one of the most important of Mindanao; it is supposed to take its rise not far north of Davao bay on the southern coast; one of its arms near the mouth communicates with a lake that lies about 14 miles N.N.E. of the town of Butuan.

The two points that form the entrance to the river may be recognized by the forts constructed on them. From the north point a great bank of sand extends more than 1½ miles to the westward, and dries at low water.

An island with trees upon it about 40 feet high divides the mouth of the river into two channels. The navigable channel shifts according to the freshets, carrying from 2 to 2½ fathoms at high-water spring tides; the current is very strong, and during the rainy season frequently brings down trunks of trees. A pilot is necessary for entering the river, there being no marks to denote the channel.*

Tides.—Only one high-water generally occurs during the 24 hours, and this by day or night according to the season.*

Butuan town is situated on the right bank of the river Butuan, about 18 miles from the mouth, and contains about 2,000 inhabitants chiefly engaged in working a gold mine in the vicinity. The anchorage is frequented by traders from port Misamis, and from Sebu, and Mr. Looney remarks that he carried from 3 to 5 fathoms of water between the bar of the river and the town. The water of the river at Butuan is fresh and used for drinking.

Supplies of cattle, pigs, poultry, rice and sago are obtainable.

The town of Butuan is celebrated in history as being the place where Magellan landed, after his anchorage near Limasana island, and where he celebrated the first mass in the Philippines.

COAST.—Diuata point is low, sandy, and surrounded by a reef which commences about Nasipit, extends out half a mile from the point, and continues round it to the southward.

Sipaka point can easily be recognised by a conical hill of good height, thinly wooded, and by a watch tower on it; the shore is clean steep-to, with soundings of 55 fathoms close to. In the bay on the east side of the point there is anchorage in 2¾ and 3½ fathoms, sand and mud, before the mouths of two rivers; the shores of the bay are low and covered by mangroves. Anchorage may also be had on the west side of the point in 2¾ fathoms, under the shelter of Kanauagor islet.

Bagakai point is not very high, and is surrounded by a reef of 2 cables extent, with 5 fathoms near it. The coast between points

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* Information received from Mr. Loney.

Sipaka and Bagakai is formed by sandy beaches alternate with rocky bluffs and mangrove shores.

Kamiguin island, lying 5½ miles to the north of point Bagakai in Mindanao, is about 12 miles long N.E. and S.W., and more than 8 miles wide east and west; it is extremely mountainous and steep, rising to a central mountain of 5,338 feet above the sea, visible 60 miles off. On the north-west part, 2½ miles east of the town and anchorage of Katarman rises a double peak 4,797 feet high. The island produces rice, good tobacco, wax, and cacao in abundance. The population amounts to 20,610 inhabitants.

There are some anchorages off it, only sheltered in certain winds, and not very safe. The *Challenger* anchored N.W. of the town of Agajo in 6 fathoms, with the north points of Kamiguin in line N. 78° E., the north-east point of Kamiguin S. 50° W., and the sandy cay north of the island N. 40° W.

Both Agajo and Manbajao points have reefs off them; the sand cay above mentioned lies three-quarters of a mile N.W. of the town of Agajo; it is about 3 cables in extent and 6 feet above the sea at high water, springs, and has bushes on it. A rocky shoal, three-quarters of a mile long lies east 2½ miles from point Manbajao.

From point Manbajao the coast is rocky as far as Maginok; a town of 4,111 inhabitants, off which there is anchorage in 9 fathoms, sand. The eastern point of the island has some sand patches off it. The town of Sagai, of 5,200 inhabitants, lies north-east 2 miles from the point, off which there is anchorage in 5½ fathoms.

On the west side of the island there is anchorage off Katarman, a town of 4,300 inhabitants, between two low points, and also in a nook to the southward of the point which forms the limit of Katarman bay. The mount Two Peaks, east of Katarman, serves as a guide to it.

The town of Katarman was destroyed in 1871: the following is a description taken from the report of the *Challenger*, which visited the island in January 1875. "The volcano at Kamiguin island burst forth in July 1871 from some low land on the west side of the island, and in two months had thrown up a hill two-thirds of a mile long, one-third wide, and about 450 feet high, destroying the whole vegetation for miles round, as also the flourishing village of Katarman on the western shore. The volcano had at the time of the visit attained a height of 1,950 feet, and was still in vigour as denoted by the column of smoke seen by day, and the series of small fires visible at its summit by night. Nearly all the inhabitants of

Kamiguin, the population of which formerly amounted to 11,000, had left the island in consequence of the outburst."

Bantiki islet, which lies nearly 4 miles off the east coast of Kamiguin, is surrounded by rocks extending half a mile off it, except on the southern side of it which can be approached, and where anchorage may be had in 2¾ fathoms, sand.

Tides.—The flood stream entering through Surigao strait, passes to the S.W. on both sides of Kamiguin island with great force, but loses its strength as it enters Makajalar bay.

NORTH COAST of MINDANAO.—Point Gorda.—From point Bagakai the coast trends to the southward, forming a slight inflexion with four towns on it. At a distance of 16½ miles is point Gorda, which is steep with a flat crown, wooded and steep-to. Balingasak bay, between point Gorda to the south, and point Banbayan to the north, is 2½ miles wide, and one mile deep to the S.E. The anchorage is in front of the town, at 2 cables from the shore, in 9 fathoms, sand and rock.

Dangers.—Constancia rock, west of point Banbayan, has not been examined, and its position is not well known. The channel between it and the point is clear.

Alutaya shoal bearing S.W. 2½ miles from point Gorda, is of oval form with a greatest diameter of one mile; at low water the centre uncovers, leaving dry a bank of sand and rocks. In the channel between it and the coast there is a depth of over 40 fathoms.

MAKAJALAR BAY is an extensive bay, open to the N.W. between point Gorda and point Sulauang. The eastern coast of the bay is steeper and higher than the western, and is formed of sandy beaches separated by a low, level, headland. The western shore is clear and steep, but from point Malujan a reef extends out 7 cables. The centre of the bay is deep, but it has not been sounded.

Hassaan, south of Gorda, is a town of 5,000 inhabitants; in the elbow, north of the town, called Kabulig bay, there is anchorage well sheltered in both monsoons, but close to the shore in 13 fathoms, muddy sand.

Kagayan river, which enters at the head of the bay, has only one fathom on the bar at low-water; but the depth and direction are constantly changing with the freshets of the rainy season. The river pours out a considerable quantity of water with a velocity of 2 knots at ordinary times. The town of Kagayan (8,900 inhabitants) lies 6 miles up the river, and small vessels ascend to it. A fair amount of trade is carried on, and gold is found by washing in the mountains.

Anchorage.—At half a mile to the N.E. of the mouth of the river, there is a small bank of sand covered by 3 to 11 fathoms water, where anchorage may be had sheltered from all winds except those from north to west. Vessels can also anchor near point Vantay in 22 fathoms.

Opol (Opot) bay is 5 miles to the west of the mouth of Kagayan river; there is anchorage in front of the town in 12 fathoms, near a sand bank. A steep reef fringes the coast to one cable distance near Opol, and extends out 7 cables to the north from point Malugan.

Alubijit anchorage is 7 miles north-west of Opol, and south of point Sulauang, where the coast forms an elbow fringed by a reef to 2½ cables distance. The anchorage is north-east of the town, in 17 fathoms, to the north of some houses on the beach.

Point Sulauang is of uniform height, covered by mangroves; rocky ledges stretch out to nearly a mile from it, surrounded by deep water.*

ILIGAN BAY.—Between point Panaon to the east, and point Bombon to the west, is a great arm of the sea, about 32 miles across, and 20 miles deep, open to the north; its shores are in general safe and steep-to.

Point Maputi.—The coast from point Sulauang curves round to the south-west for 14 miles to point Maputi which is broad and rugged. On the north side of the point there is a little bay, Initao, in which small craft can find anchorage in 2¾ fathoms, in front of the town.

Kinalong roads offers anchorage in 14 fathoms, sheltered from the eastward, but very close to the shore. Iligan river, situated in the south-east angle of the Iligan bay, is of some importance, and communicates with a lake distant 23 miles from the mouth; the bar is deep but there are reefs at the entrance. The town of Iligan, of 5,500 inhabitants is on the left bank of the river in a fertile plain.

Point Binuni is low, clean and steep-to. The bight of the coast between it and Iligan river is bordered by sand beaches with some rocks, and receives the waters of several rivers. Anchorage may be had in 7 fathoms close to the shore, which is steep. The shore to the westward as far as point Binuni is clean.

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* The chart shows only a narrow fringing reef.

Panguil bay.*—This is the name given in the Derrotero to the inlet in the south-west angle of Iligan bay included between points Binuni and Tabú, which form the entrance to port Misamis. The western shore of the inlet is formed by the slopes of mount Malindang and the lesser hills S.S.E. of it. On the south side of port Misamis are three hills, the highest of which is 2,312 feet high.

PORT MISAMIS is formed by a channel 10 miles long, and one to 2 miles wide, ending in a shallow circular basin 5 miles in diameter. The sides of the port are low and covered by mangroves; but to the northward of the town of Misamis there is an extended sandy shore, and to the southward there is a line of higher coast.

Eastern shore.—Point Binuni is round, covered by mangroves, and has some rocks off it; from this point the shore trends W.S.W. for 4 miles, low and covered by mangroves to point Lianga, near which there are patches of sand covered by 3½ and 5½ fathoms, affording anchorage sheltered from the south-west. Narvaez bank is a small patch of coral, covered by 1¾ fathoms, lying W. ¾ N. 1½ miles from a little house on point Lianga. A reef with 2¾ to 6 fathoms on its western edge lies in mid-channel at 7½ cables from the western shore of the point; the rest of this reef has not been sounded.

Western shore.—Point Tabú is low and sandy, with shoal water off it. From this point a reef of coral 8 cables wide fringes the shore to the southward nearly as far as Lokulau, where two little rivers discharge. Anchorage may be had east of the fort of Lokulau in 6½ fathoms; to the north and south of this bearing the bottom is strewn with large rocks. From Lokulau to Misamis the shore is low and sandy, with mangroves in places, and shoal water in the vicinity.

Lokulau shoals are two banks of sand and rock on which large trunks of trees may often be seen stranded by currents. The longest of the two is oval in form, 9 cables in diameter, and is separated from the coast by a channel of about 4 cables width with 3½ to 9 fathoms depth. The eastern edge of the banks, near which there are 18 fathoms, bears N. 48° E. of Port Misamis. South of Misamis the channel is clean and steep with a depth of 4½ to 7 fathoms, sand, throughout its length to the entrance of the inner basin, where the depth increases to 9 fathoms, and then falls again to half a fathom at the bottom of the bay: several small rivers enter the bay here between the mangroves.

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* *See* Admiralty plan, Ports in the Philippines, Port Misamis, No. 957; scale $m = 0{\cdot}64$ of an inch.

Anchorage.—The anchorage of Misamis is on the western shore between the point of the fort and point Pulut a mile to the S.W. It is completely sheltered from the sea and all winds, and vessels can lie along the shore and put a plank on shore in front of the town in 4½ fathoms, sand.

The town of Misamis, of 5,800 inhabitants is divided into the old and new towns, 220 yards apart, joined by a bridge.

Directions.—To enter the port of Misamis from a position 2 miles abreast of point Tabú, a vessel should steer south, until the fort of Misamis bears S. 58° W. when a course S. 55° W. will lead in mid-channel between Lokulau and Narvaez shoals in 5½ and 6½ fathoms to pass near the fort, and thence to the anchorage west of it.

COAST.—Diualan point is low, covered by mangroves, very clean, and bordered by a sand beach. Between points Tabú and Diualan a reef of sand and rocks extends to a mile off shore, and dries in places at low water.

Point Layaban is low and sandy, with depths of 7 and 8 fathoms sand, at a short distance.

Point Polo, 7 miles N.N.W. of Layaban point, is of dark rock, clean and steep-to, with trees on it reaching to the water's edge. The coast between the two points is bordered by mangroves, and, south of point Polo near the shore, there are two islets surrounded by a reef which extends outwards one mile.

Point Bombon, 6 miles from point Polo, is low, clean, and steep to; an intermediate point forms with point Polo a little bay into which flows the river Tabukan, and where anchorage may be had sheltered from westerly and southerly winds.

Murciélagos bay between point Bombon, and point Silla is surrounded by a reef which extends to a mile from the sandy shore; on the west coast, south of point Silla there are three islets within the reef, named Murciélagos. Point Bombon also has three rocky islets joined to its N.W. side, and the reef projects at this part to 1¼ miles towards the middle of the bay. There is anchorage in 5½ fathoms, mud, near the river which enters the eastern angle of the bay; everywhere else in the bay there is no bottom with 45 fathoms.

Point Silla is of considerable height, and remarkable, as it takes the shape of a saddle; rocks surround it at not more than a cables distance.

Point Tagolo is not very high, and is surrounded by a narrow reef; but at one cable's distance from it no bottom was found with 36 fathoms. A patch of *cogonal* on it is visible 20 miles off. Between points Silla and Tagolo there is an intermediate point, Baloi, which is high, rocky, and very rugged, its peaks showing most fantastic outlines. The shore from Silla to this point is low, and covered with mangroves, with rocks off it; but from the point to Tagolo it is high and steep.

Tides.—The tidal streams are very strong off this part of the coast. The flood makes to the east, and the ebb to the west.

Silino island which lies N. by E. ½ E. 7½ miles from point Tagolo is about 1½ miles in extent, and low, flat, and wooded with sandy shores bordered by reefs that do not project far.

Alikai island, lying W. ½ N. 8 miles from point Tagolo is more than 2 miles long from east to west, and one mile wide; it is also low, flat, and wooded with sandy shores, and bordered by reefs of no great extent.

Banks.—In 1871 the *Nassau* obtained a sounding of 7 fathoms with Alikai island bearing south, distant 2 miles; and in 1875 the *Challenger* passed over a small coral patch of 6 fathoms, the bottom being distinctly seen. Only two casts of the lead were obtained on it, there being no bottom with 20 fathoms on either side. From it the extremities of Alikai island bore N. 13° W. and N. 27° W., and point Tagolo N. 81° E. It is therefore probable that there are other patches in the vicinity.

DAPITAN BAY,* contained between point Tagolo to the north and point Sikayak to the south, is sheltered from all winds but westerly ones. The depth at the entrance is 17 fathoms and 4½ fathoms at the anchorage before the town. The little port of Talaguilong is in the northern part of the bay.

The northern coast of the bay is high; point Tubud (Tugod), at 1½ miles south of point Tagolo, is remarkable by having over it a remarkable, isolated, conical hill covered by *cogon*; a reef which uncovers at low-water lies west 3 cables of the point, and the shore between it and point Tagolo is foul.

LIGHT.—On point Tubud a fixed *red* light is exhibited, raised 43 feet above the sea, and visible in clear weather from a distance of 11 miles through an arc of 213½° between the bearings S. and N. 33½° W. The lighthouse, 23 feet high, is of iron, painted white.

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* *See* Admiralty plan. No. 957. Parts in the Philippines: scale, m = 0·8 of an inch.

Port Talaguilong is nearly circular in form, 7 cables in diameter, completely shut in, and very convenient for vessels of all sizes; the depth of water is from 5½ to 8 fathoms, mud; a narrow, steep reef lines the shores; the entrance passage is 1½ cables wide between the reefs, and 9 fathoms deep.

Tides.—From a few observations made in 1836 by Captain Halcon, of the Spanish Navy, the time of high water in port Talaguilong, at full and change is at 3h. 40m.; springs rise 5 feet.

Dapitan river and town.—The bar of the river has very little water on it at low water, *lanchas* can enter at high water. The town, of 5,700 inhabitants, is on the left bank of the river near the shore; it exports good cacao, wax, and maize; cattle are to be had in abundance.

NORTH-WEST COAST.—Point Sikayak is surrounded by a reef which extends to 3 cables from the point and fringes the shore to the north-eastward as far as point Botogan.

A great bay, clear and with good anchorage stretches between point Sikayak and point Blanca. Three rivers, their mouths defended by forts, enter the bay. The land behind is mountainous.

Point Blanca, one of the most remarkable features of the coast, is a perpendicular cliff of white stone 26 feet high; it forms a horizontal table covered by grass with no trees upon it. During the rainy season, a rivulet of good water falls from this table-land. The vicinity of the point is shoal; at 2 cables from it there are 1½ fathoms Anchorage may be had eastward of the point in 4½ fathoms, and also in the bay between point Blanca and point Dauit.

Point Dauit is clear and steep-to, and can be recognised by a little hill that takes the form of an obelisk.

Point Tabonan is high, rocky, and very steep, with a flat summit; there is anchorage in the bay which this point forms with point Dauit.

Point Dauigan is also high and steep with a flat top; on its S.W. side there is a narrow reef with 9 fathoms near it. Anchorage may be had in the southern angle of the bay between points Dauigan and Tabonan in 11 fathoms; the other parts of the bay are foul.

Sindangan bay.—The shores of this bay are exceedingly steep; anchorage may be had south of point Dauigan in 3 fathoms, and also east of point Sandingan in 11 fathoms, very close to the shore; everywhere else the bay is too deep near the shore for anchorage.

Point Sandingan is a steep rocky bluff, bordered by a narrow shoal of rocks and sand with breakers at the distance of one cable.

KIPIT or GALERA POINT is low, flat, and sandy with shoal water off it; the bay to the eastward, into which the river Kipit flows, is shoal with 6 fathoms at the distance of a mile from the coast; the surrounding land is low.

The **Murcielagos islands** which lie north 2½ miles from point Kipit are situated on an oval reef about a mile in length from W.N.W. to E.S.E.; with soundings of 4½ to 8 fathoms around its edge. The islands are low, and the largest—the easternmost—is 3 cables in length. Anchorage may be had S.E. of the island in 7 fathoms, sand. The channel between the islands and point Kipit is clear and safe, with a depth of 18 fathoms in the middle of it.

Coast.—To the westward of point Kipit the coast is low, and bordered by sand beaches separated by rocky headlands, and cut into by several little rivers. Anchorage may be had at one mile from the shore in 7 fathoms, fine sand. The wood on the coast is that named *Agojos*, a tree similar to the pine of Europe. High mountains can be seen inland, and also hills covered with *cogonal.*

Gorda head and **point Coronada,** are both high and steep, but Gorda head which lies 5 miles N.E. of point Coronada is much the highest, and is liable, on coming from the southward to be mistaken for the western extremity of the land.

Winds on the north coast of Mindanao.—Both monsoons blow with strength on this part of the coast, and together with the tides from the straight of Surigao raise a chopping sea. During the S.W. monsoon the land breezes are regular; they blow from sunset to morning, and shift sometimes to S.E. and E.S.E.; but during the *collas* it remains steady at S.W. *Collas* is the name given in the Philippines to the S.W. gales that blow occasionally from July to October, with violent squalls and heavy rain.

During the N.E. monsoon the land breezes are not regular, but still they are experienced when the monsoon is established, and the winds vary from North to N.E. and E.N.E. The coast is very exposed at that season.

In navigating this coast under sail, in either monsoon the coast of Mindanao should be approached in order to profit by the land breezes; but care must be taken to guard against the violent squalls that come off the mountains.

Currents.—Between the islands Panaon and Kamiguin there is a constant current to the west. South of Bohul the currents follow the direction of the prevailing monsoon. Near the coasts, and within the great bays the current is influenced by the discharge from the rivers.

WEST COAST of MINDANAO.—From point Coronada the coast is clean and steep-to as far as point Balangonan, which lies 15 miles S.W. by S. Coronada bay, south of the point of the same name, is sheltered from all winds but those of S.W., and offers anchorage in 9 to 13 fathoms, sandy bottom. In the angle to the northward, where a little river enters, the depth is 2¾ to 4 fathoms.

Balangonan point is composed of dark ferruginous rock, low and very steep-to. The little bay to the east of it is more sheltered than that of Coronada, but its shores are very steep, so that to get 10 fathoms it is necessary to go very close in shore. At a mile to the northward of the north point of this bay there is a small islet clean and steep.

Port Santa Maria*.—This well-sheltered little port is situated immediately to the southward of Balangonan point. It is about a mile deep to the S.W. and contains two little basins of 13 fathoms depth, very convenient for vessels of good size. The entrance is 2 cables wide and 36 fathoms deep. In the middle of the port the depth is 15 fathoms and little less near the shore. A narrow reef lines the coast and extends to the distance of one cable from the entrance points of the western basin. The shores are low and covered by forests of good trees ; amongst them teak is to be found. Water can be obtained from a little river in the eastern end of the port.

Point Balanguin (Dulanguin) to the S.W. of the port is rocky and of no great height, steep-to ; it resembles point Balangonan, and, coming from the southward, may be taken for it. At 3 cables from the coast between this point and port Santa Maria, there are four detached rocks, clean.

Sikogon bay, between points Balanguin and Sikogon is clean, deep, and bordered by a beach of white sand, where two rivers discharge ; some rocks lie near the shore in the middle of the bay. The depth at 2 cables from the shore is 4½ to 5½ fathoms, sand.

Sikogon point is rocky, clean and steep-to. In the north-east angle of Panabutan bay, to the south of the point, there is anchorage in 7 to 22 fathoms, sand, between two rocky points. The rivers Sikogon and Siraguai are shallow. The natives are numerous in this place ; they grow maize and tobacco, and carry on trade with the Sulu islands. Wood and water can be obtained.

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* *See* Admiralty plan : Ports in the Philippines, No. 957 ; scale, *m* = 1·6 inches.

Kavit bay is semi-circular, of a diameter of 9 cables, with sandy shores and small steep reefs on both sides of the entrance. Near the south shore there is an islet of one cable extent, clean and steep on the eastern side, with a narrow reef on the western side. In the bay there is good anchorage in $4\frac{1}{2}$ to 9 fathoms, sand, under shelter of the islet.

Point Kavit is high and steep ; the sea-face is composed of red earth ; the summit is rounded and covered with wood.

Coast.—From point Kavit to point Batu-Tandok which lies 9 miles S. by W. $\frac{1}{2}$ W. the coast is clear and steep, and forms little bays between the intermediate points Piakan and Nanga, which points are high, rugged, and steep. This part of the coast, like all the west coast of Mindanao, presents an agreeable aspect of hills covered with verdure, and cultivated land, with a great number of houses.

Point Batu-Tandok is high, clean, and steep, with a flat summit ; at 130 yards from it is a small pointed rock from which the point appears to take its name—Horn rock ; between this point and point Nanga there is anchorage near the shore in $2\frac{3}{4}$ to 8 fathoms.

Sibuko bay* which lies between point Batu-Tandok and point Buril, 4 miles to the southward, penetrates 2 miles to the eastward and is very safe, with steep shores bordered by a long beach of sand, with a little river at each end of it where boats can enter and obtain water, even at low tide. The depth in the bay is not less than 27 fathoms except very close to the beach where 11 fathoms can be obtained. The anchorage is good, but a sea sets in with westerly winds. The town of Sibuko of 5,000 inhabitants is 2 miles inland. The people are peaceful, and the land cultivated. Provisions are procurable.

Coast.—To the southward of Sibuko bay the coast is high, clean, and steep, and bordered by sand beaches interrupted by rocky cliffs as far as point Batulampan, the western point of Mindanao. From point Batulampan to Samboangan it is low, covered with trees, and bordered by steep sand beaches with a depth of 14 fathoms at a cable's distance. Coasters going from Samboangan when the wind and tide are against them, land their crews and track their vessels to point Caldera.

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* *See* Admiralty Plan, Ports in the Philippines, No. 857 ; scale, $m = 0{\cdot}8$ of an inch.

Point Batulampon is of even height, and steep with a flat crown ; point Alimpaya, about a mile to the northward of it, is flat and sandy ; points Dumalon and Caldera are sand-beaches ; all these points, as also the rounded coast they define, are clean and steep-to

The tidal streams, which at springs reach a velocity of 5 knots, strike point Caldera with great force.

The coast from Caldera to Samboanga and the anchorage off Samboanga has been described with Basilan strait in Chapter II.

CHAPTER VIII.

VERDE ISLAND PASSAGE TO SAN BERNARDINO STRAIT; MARINDUQUE, BURIAS, TIKAO AND MASBATE ISLANDS; NORTH AND WEST COASTS OF SAMAR.

Variation 1° 0′ East in 1890.

SOUTH COAST OF LUZON.*

TAYABAS BAY.—From point Sigayan or Lokoloko the shore is of the same nature for 4 miles E.N.E. to point Bantiki, which is surrounded by rocks to the distance of 3 cables. The land behind these headlands is low and thickly wooded, and appears almost entirely sunk when seen from the neighbourhood of the south point of Marinduque.

Kolokonto bay.—At 1½ miles N.W. of point Bantiki is the S.E. point of an inlet named Kolokonto bay, the entrance of which is two-thirds of a mile wide, and which runs one mile inland; there is a small islet within it covered with trees, and in front of the entrance several rocks which mostly dry at low water. This inlet serves as shelter to small craft in S.W. gales.

Coast.—From the N.W. point of Kolokonto bay the coast trends round to the northward; it is of regular height, wooded, and bordered by a sand beach. The river Nayun enters the sea at 6 miles from the last point. Its mouth is only half a cable wide and 1½ fathoms deep at low water inside the bar, which itself is two cables wide with 3 feet least depth. At half a mile up the stream from the entrance are several wooded islets, and here the river divides into two arms, both of salt water. The river Nayun offers shelter to small coasters, for at its mouth there are from 2 to 4 fathoms, lessening towards the islets.

Anchorage.—Vessels of all sizes can anchor off the coast between the mouth of the river and Kolokonto bay, at a quarter of a mile from the shore in 12 fathoms, mud.

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* *See* Admiralty chart:—Between St. Bernardino and Mindoro straits, No. 2,577; scale, *m* = 0·1 of an inch.

Tayabas river.—The coast from the river Nayun is low, and bordered with sand beach as far as the river Tayabas, which is three-quarters of a cable wide at the entrance; its bar is 2 cables wide, and in the entrance channel the depth is one fathom at high water, increasing within to 2 fathoms. Native craft, called *parados* and *karakoas*, frequent this river, and armed launches sometimes go up as far as a place named Kota, at one mile from the mouth. The channel is easy to recognize by the stakes placed every year by the natives. Fresh water can be obtained at some distance from the mouth.

Reef.—A small shoal which uncovers at spring tides lies half a mile S.W. by S. of the mouth of the river; from this shoal a reef extends 6½ miles E.S.E., fronting the coast to a distance of 6½ miles from Bantiki point, the eastern point of Pagbilao bay, and nearly closing up the mouth of that bay. The soundings off the edge of this reef are irregular, from 3 to 11 fathoms.

Pagbilao bay,* which lies between Bantiki point and Pagbilao island, is of wide extent, but the available part of it is reduced by reefs to a circular space of about 1½ miles diameter. A pilot is needed to enter this bay, on account of the reefs which border the entrance near the S.W. point of Pagbilao Grande; the depth of the channel is from 8 to 10 fathoms; and of the space within, from 3 to 5 fathoms, mud.

Pagbilao Grande island is of triangular form, and nearly joined to the main land, forming with it the bays of Pagbilao to the west, and Languinmanok to the east. Mount Mitra on the N.E. part is 285 feet high. The southern point is steep-to, having a depth of 13 fathoms, mud, at 2 cables from it. This is the point to make for to enter the bay of Pagbilao. Pagbilao Chica is united to the larger island by a strip of sand; it is crescent-shaped, forming to the westward the little bay of Kapaluan, at the mouth of which is 15 fathoms, sand, diminishing to 5½ fathoms, rock, at the edge of the shoal water that fills the upper part of the bay.

Languinmanok port is reduced by reefs from the coasts on both sides to a channel 7 cables wide and 3 miles long, in which the soundings gradually lessen from 11 fathoms to 2½, sand and mud. Great care must be taken to keep clear of the reefs, which advance from both sides of the entry, narrowing the channel considerably, and of two shoals which lie in line with Languinmanok vantay, and a rock 3 cables S. ½ W. of it. These shoals are situated respectively S. 50° W., and S. 30° W. of point Tubig Mangayao.

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* *See* Admiralty plan:—Ports in the Philippines, No. 2,395; scale, $m = 0{\cdot}7$ of an inch.

Tides.—It is high water, full and change, at 1.30; springs rise 5¼ feet.

Coast.—The eastern shore of Tayabas bay, from Languinmanok port to point Tuguian, is of moderate height, and fringed with reefs, which extend to 2 miles from shore in some places; on the edge of these reefs the soundings are from 3½ to 12 fathoms, and from 15 to 18 at a little distance. There is anchorage in 4 or 5 fathoms, sand and mud, off the mouth of a little river which enters near a bay north of Silankapo point, 12 miles from Languinmanok. The town of Kalailayan is near this river.

Shoal.—There is a rocky shoal 2 miles N.W. of Silankapo point, extending one mile from N.E. to S.W., with 10 fathoms, coral, outside of it, and 8 fathoms in the narrow passage between it and the shore-reef.

Pitogo.—At 5 miles E.S.E. of Silankapo point is Mabio point; and 2 miles E.N.E. of Mabio is the small town of Pitogo, of 900 inhabitants, with anchorage before it in 4 fathoms. When making for this anchorage, vessels must keep close to the western shore, as the coast to the eastward is very foul, with rocks at a short distance from it.

Tuguian point.—The coast reef projects only half a mile off this point, and anchorage can be found under the point in 9 fathoms, mud.

Shoal.—At 3½ miles N.W. ½ N. of point Tuguian there is a rocky shoal of small extent, with 3½ fathoms off its southern edge, and 10 fathoms off the N.E. side; there is a passage between it and the coast from which it is separated 1½ miles.

Caution.—In navigating this coast, it should not be approached within 3 or 4 miles. In the passage between Tuguian point and the island Mompog the flood tide sets to the S.E., and the ebb to the N.W.

Katanauan bay, 5 miles E.S.E. of point Tuguian, is clean and offers shelter from northerly and easterly winds in 3½ to 7 fathoms, sand and mud. A river flows into it, and on the left bank is the town of Katanauan, of 1,700 inhabitants. The west point of the entrance is of sand, and the other mangroves. Both points send out reefs, the western to a distance of one mile, and the eastern to 2 miles.

2 [illegible] 2

Between Katanauan and Malanai, a distance of 6 miles; the depth is 9 fathoms, sand, at one mile from the coast.

Malanai anchorage is in a bight of the coast E.S.E. of point Ajus. A river enters the sea at the bottom of the bight, having on its left bank the town of Malanai (or Yendo), of 1,300 inhabitants, in front of which there is anchorage in 5 fathoms, mud.

Point Lipata is hilly, and covered with mangroves and sand patches; a ridge of rocks extends some distance to the northward of it.

The coast between Malanai bay and Bondog point is fringed with rocks which extend to half a mile from the shore to the northward of Ayoni bay.

Shoal.—A rocky shoal, one mile in extent, with 3 fathoms water at the edge and 7 to 13 fathoms around it, lies about 2 miles N.W. of Subunguin point, and 3 miles from the coast. The channel between this shoal and the coast reef is 2 miles wide, clear of danger, and 17 to 24 fathoms deep.

Pinamuntangan point.—Aguasa bay, to the northward of point Pinamuntangan, has rocks before its entrance. Pinamuntangan bay, between Aguasa bay and point Pinamuntangan, is small and open to the west. It is bordered on its northern and southern sides by a beach of sand and mangroves; to the northward of the point is a depth of 11 fathoms, shoaling gradually to the shore.

The coast from Pinamuntangan point runs 7½ miles to the S.E. to Bondog point, ending in a sandy beach with detached rocks near it.

BONDOG HEAD (Cabezo de Bondog) is a mountain 1,250 feet high, visible in clear weather at a distance of 30 miles.

Point Bondog is the southern extremity of the peninsula between Tayabas bay and Ragai gulf; the vicinity is rocky, as is also the part of the coast to the N.E.; but the low land soon re-appears, and continues as far as point Arena. The face of the coast here presents several open bays with sandy beaches, offering good anchorages of sandy bottom; the depths in them decrease gradually to 8 fathoms at a short distance from the shore; the heights are wooded, and the plains afford good pasturage. There are several herds of buffaloes; and antelopes abound, which may be hunted without difficulty.

Shoal.—At 3 miles E.N.E. of point Bondog, and 4 miles S. 60° W. of point Arena, there is a rocky shoal; the anchorage N.E. of it is good.

MARINDUQUE ISLAND, situated before the eastern entrance of Verde island, is nearly circular, with its greatest diameter 24 miles; it is mountainous and elevated, having a range of hills on its eastern side running north and south, consisting of the mountains Tapian, S. Antonio, and Marlanga; the soil is fertile, but it offers few resources, the principal production being rice.

There are two ports, of no great importance, that of San Andres to the N.W., and of Santa Cruz to the N.E.; and several bays which offer shelter according to the seasons on the east, south, and west sides; but these anchorages are not very good, and the coast towns are very poor. The total population is about 21,700 persons.

Port Banalakan, or San Andres, is surrounded by high wooded land, and vessels can lie inside in all security. The anchorage is confined, but the depth is good—10 to 12 fathoms, mud; there is an inner harbour which can be entered by towing or warping through the narrow passage, hardly a cable wide, and obstructed by an islet in the middle of the channel. This inner basin is of three-quarters of a mile extent, and of 5½ to 8 fathoms depth, muddy bottom. A large vessel would find herself not only sheltered in it from all winds, but completely hidden, for it is entirely closed in, and its existence would not be suspected without previous knowledge.

Directions.—On entering or leaving the port Banalakan, the southern shore must be kept, at one cable from which are 10 to 18 fathoms, in order to avoid a rocky patch of great extent off the north side of the entrance; this patch has a quarter of a fathom on it, and lies S.E. of two islets surrounded by rocks that are before the entrance; the entire N.W. headland of the island is foul.

Water is difficult to obtain, as it is necessary to go well up the river to obtain it fresh, and when there it takes a long time to fill the casks.

San Andres islets are two islets which stretch rather more than a mile to the west of the N.W. point of the island Marinduque; the distance between them is one cable, and the same between the nearest of them and the shore; these passages are foul, but the sea fronts are clear.

Point San Andres, the northern point of the island, is mountainous, and very steep.

North coast.—Between point San Andres and point Santa Cruz, 8½ miles to the eastward, the coast is formed into two bays by Trapichihan point; that to the westward, though lined with rocks, is deep, having 22 fathoms in the middle; that to the eastward is closed by a reef which projects between the islets off point Trapichihan, and continues as far as Santa Cruz, with soundings of 10 fathoms at its edge. Point Santa Cruz is low and covered with mangroves. A reef with large rocks awash at low-water advances from this point a mile to the E.S.E., and forms, together with another reef that projects from the island Santa Cruz (Anibaya), the northern mouth of port Santa Cruz.

Santa Cruz port is only fit for small craft, but larger vessels can find anchorage with sandy bottom in the channels formed by the islands at the entrance, or, in case of need they can penetrate further by warping ; but great care is required to avoid the detached rocks. The town affords but few resources.

Directions.—To enter by the north channel, bring the island Santa Cruz to bear S.E. ; give sufficient berth to the reef that extends from it, and follow the channel to the south by soundings until the port is opened ; the soundings are from 6 to 16 fathoms in the passage, and 5 towards the anchorage, shoaling to 3 fathoms, mud, off the *baluarte.*

To enter by the East channel, pass the island Santa Cruz at one-third of the distance between it and Marinduque, which will give the deepest water ; this channel is less tortuous than the northern one, and the soundings are more regular ; the width is one mile from side to side.

Anibayas.—This is the name of the group of three islands before the port Santa Cruz, consisting of Santa Cruz, Maniuayan, and Mompog. The two first are low to the westward, of regular height in the middle, and hilly to the eastward. All three are surrounded by reefs which narrow the channels between them. These channels are only used by coasters. A vessel leaving Santa Cruz port by the Northern channel in order to go to the southward should keep all these islands on the starboard hand, giving them a berth of a mile to clear their reefs which project thus far, and she should not trust a smooth appearance of the water. If driven to take the passage between Maniuayan and Mompog, she should keep near to the latter island, for the reefs from Maniuayan approach to within half a mile of Mompog.

Salomague point, 8½ miles S.E. of Santa Cruz, is the easternmost point of the island ; it is low and covered with mangroves. The coast between these points is fringed with rocks to a distance of half a mile out from it ; the soundings at the edge are 6 to 11 fathoms, rock, increasing to 54, mud, at 2 miles from it. Between Salomague and point Marlanga there is a bay, in the southern part of which, between points Kabuyok and Paniki there is good anchorage near the shore in 12 fathoms, mud.

Marlanga point is dominated by a high mountain, the north-west shoulder of which marks the commencement of the anchorage. The coast is safe from point Marlanga to point Saban, and may be approached to within 2 cables, at which distance the soundings will be 20 fathoms. These two points are spurs of the above named mountain.

Elephant islet, about half a mile south of point Saban, is a steep sugar-loaf rock, with a few trees upon it. On the north-east side there is a little creek with a sand beach and 4½ fathoms depth. Between the islet and Marinduque there is 12 fathoms, sand. The French chart gives a little reef off Saban, but it must be small. Suban

Tres Reyes are three islands of moderate height, peaked, and clean except the easternmost, Gaspar, which has rocks on its east side. Between these islets and Marinduque there is a safe passage if care be taken to avoid a shoal of 2½ fathoms nearer the coast of Marinduque than the middle of the passage.

Point Banod, or Gazan, is fronted by a reef which extends half a mile to the south-east, and joins the shore again off the town of Gazan; the 2½ fathoms shoal just mentioned seems to be a part of this reef, detached to the south. The town Gazan, of 700 inhabitants, is 2 miles north of the point. The anchorage is on the open coast, at a distance from the beach, and quite exposed.

Point Kauit is low and sandy; a reef runs from it to the S.S.E. as far as Gazan reef, but to the northward the coast, which is of sand beach, is clean as far as point Datinuana, and to 3 miles beyond and may be approached with safety; from here a sand bank with 7 fathoms at its outer edge stretches along at half a mile from the shore as far as the S.E. point of port Banalakan.

Buak river and town.—The town is situated on the left bank at 1½ miles from the mouth of the river which enters the sea to the southward of point Datinuana. It contains 11,000 inhabitants, and carries on a fair trade with Manila. Steamers call here about once in a week or ten days.

Anchorage.—The anchorage is S.W. of a stone fort at the mouth of the river, at 2 cables from the shore, in 5 to 12 fathoms, coarse sand.

TIDAL STREAMS.—In the part of the sea between Masbate island and Mindoro the currents are not strong except off point

Arena, the south-eastern extreme of Bondog peninsula, where they acquire some force from the quantity of water that enters and leaves the gulf of Ragai; but in Verde island passage the tidal streams reach a velocity of 3 to 4 knots, and the branches which pass on either side of Verde island cause strong eddies at their meeting again, and at point Escarceo even a partial reversal of the stream.

The flood streams from the China sea through Verde island passage, and from the Pacific through San Bernardino strait meet and neutralize each other nearly in the meridian of point Bondog, or in the line between point Bondog, and Romblon island. The ebb streams set in the reverse direction, *i.e.* from Bondog peninsula outwards, and it has been observed that on coming to point Bondog with a fair tide a reverse has been experienced on passing its meridian. The tidal hour of this point has not been determined.

WINDS on the SOUTH COAST of LUZON. — In Tayabas bay and the gulf of Ragai the land breeze which sets in during the night in both monsoons is generally feeble, but sometimes squally, thereby compelling a sailing vessel to anchor in order to avoid being driven off the coast.

GULF of RAGAI.—The gulf of Ragai, included between point Bondog to the west, and point Kadburauan (Panganiran) to the east, 43 miles apart, runs 65 miles inland to the north-west, and, along with the river Viñas which enters the gulf at its head, almost severs the island of Luzon in two at this part, separating the provinces of Tayabas and Camarines Norte. The gulf of Ragai is generally clear and deep. The port of Pusgo or Mayasas on the west coast, and Pasakao bay on the east coast are its most frequented anchorages. The entrance of the gulf is divided into two channels by Burias island with the islands and shoals off its northern end.

WEST COAST of RAGAI GULF. — The coast between point Arena and port Pusgo is moderately high and steep-to, with soundings of 7 to 14 fathoms off it, except at the part opposite Alibijaban island where a reef extends along the coast for 3 miles; anchorage can be had off the coast generally, but not close in as there are rocks close to the shore.

Sombokobon bay, 5½ miles N.N.E. of point Arena is much frequented by native coasters. In the middle of the bay there is a rocky shoal with a narrow channel between it and the shore. The north point of the bay ends in a reef which projects to the S.E. and forms a semicircle offering shelter and anchorage in 3½ fathoms, fine sand. The town of Sombokobon is on the north-west side of the bay.

Alibijaban island, 3½ miles north of Sombokobon bay, is 2½ miles long north and south, and three-quarters of a mile wide; low, wooded, and surrounded by a reef which extends one mile to the southward and half a mile out from the other sides, with irregular soundings near its edges; in the northern part of this reef there is a little bay with a depth of 4 fathoms, and off the southern end there is a small anchorage with a depth of 14 fathoms. The channel between the island and the reef on the main coast opposite is 1¼ miles wide, and 23 fathoms deep. From the most salient point of the reef point Arena bears S. 8° E. and point Gorda, north of Pusgo, N. 21° W.

Palad bank, 5 miles north of Alibijaban island, is a bank of sand one mile long, 10 feet above water, and surrounded by rocks. It can be seen in daylight from a good distance, and at a sufficient distance to avoid it on a clear night. The channel between the bank and the main coast is 2 miles wide and 12 fathoms deep.

Port Pusgo* is a narrow inlet which penetrates 5 miles to the N.W. The width between the southern entrance points is 1⅓ miles, but the navigable space is considerably reduced by a shoal which extends along the main shore, and half way up the inlet there is only one cable width. The depth in mid-channel is 4½ to 5 fathoms from the entrance to as far as one mile past the narrowest part, but in the inner harbour generally it is less than 1¾ fathoms deep. The town San Narcisso of 1,107 inhabitants stands at the extreme head of the inlet.

Shoal.—In the middle of the entrance at 1½ miles S. 25° E. of point Pusgo, there is a rocky bank 1½ cables in extent covered by 10 feet of water.

Point Gorda lies 1¼ miles N. by W. of point Pusgo, and is high and steep with a flat crown. The reef, which from the interior of port Pusgo fringes the coast, continues round point Gorda to the north-west, at a distance of 2 to 4 cables from the shore. A shoal, covered by 1¾ fathoms water lies 5 miles north-west of point Gorda, and one mile from the shore.

Piris bay, 13½ miles N.W. by N. of point Gorda, is bordered by a shoal of mud covered by 1¾ fathoms water, which considerably reduces the available space; anchorage can be had in the north-west part of the bay in 5½ fathoms. Point Lian, the northern point of the bay, is of moderate height and skirted by a reef which projects half a mile from it to seaward.

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* *See* Admiralty plan:—Ports in the Philippines, No. 2,395; scale, $m = 2 \cdot 0$ inches.

Point Kapuluan, 5 miles north of point Lian, is surrounded by the reef which borders the coast for 2½ miles to the northward. Kapuluan rocks, 2¼ miles east of the point of the same name, form a shoal a third of a mile in extent, on which there are several rocks awash, with 4½ to 14 fathoms near it.

Acha shoal, 5 miles N. by W. of point Kapuluan is a rocky shoal 2 cables long north and south, covered by one fathom water* at its edge. It lies 2¾ miles from the coast, and 1¼ miles from Sipalon island, a low peaked island separated from the reef of the north coast.

Vinas river, which enters the gulf at the extreme head of it, is shallow, the depth at the mouth being only 5½ feet.

EAST COAST of RAGAI GULF.—Talkauayan bay is 1½ miles wide and runs 2½ miles to the northward; the depth of water in it decreases gradually from 7 fathoms at the mouth to 3 fathoms at the head.

Katabanga bay, 3 miles S.E. of Talkauayan bay, is nearly 4 miles wide between points Guilbai and Bagutayok, and is lined with rocks. The depth towards the northern part is 11 fathoms. There is anchorage in the southern part near the little river Katabanga.

Ragai bay, between point Omon to the north and point Oktok and Saban island to the south, offers good anchorage, sheltered in both monsoons in depths of 17 to 1½ fathoms, mud. Sabun island, one mile long east and west, is almost united to point Oktok at low water; its northern side is steep-to, but a reef projects one mile to seaward from the western point. The southern shore is foul.

Kaima bay, included between Sabun island and point Bantuin or Galvanei, 8 miles to the S.E. is bordered by a reef. There is anchorage near this reef off the town of Bangon in 8 to 12 fathoms, and also in places nearer point Bantuin, in 7 fathoms. Point Bantuin is high and steep, and only connected with the main coast by a strip of low land half a cable wide. The two islets Galvanei are respectively half a mile and one mile N.W. of the point.

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* The chart shows 1¾ fathoms.

Coast.—From point Bantuin (Galvanei) the coast trends south-east for 13 miles to point Tanuan, and is mountainous and bold. The river Tinagbud enters about midway between the two points; anchorage may be had off the mouth in 4 fathoms. A sharp peaked rock lies 2 cables from point Buri, south of Tingabud. Point Tanuan is steep with a flat crown, and from this point the coast trends E. by S. for 5 miles, high, and fronted by sand beaches as far as Pasakao anchorage.

Pasakao anchorage is situated between two little flat-topped hills, the westernmost of which terminates in a mangrove covered point and a reef which projects half a mile to the S.E. The best anchorage is in 3 to 4 fathoms, in front of the town, and north of the high flat islet Refugio which lies half a mile from the southern point. This little islet is surrounded by a reef one cable wide, and steep-to, with soundings of 37 fathoms at a short distance to the southward. The channel between the islet and the coast has a depth of 11 fathoms. In taking this passage the islet should be kept closer than the main land. Steamers call here fortnightly.

Coast.—From Pasakao anchorage to point Makoto the coast is high, steep-to; and bordered by sand beaches between the intermediate points. Anchorage may be had very close to the shore north of point Sibono, 7 miles S.E. by E. of Pasakao, in Jamuaron bay, north of the point of the same name, in 6 fathoms; vessels can also anchor in the elbow which the coast makes at the town of Pantao, north of point Kauanhahan. A shoal surrounds this point to a distance of one cable, and lines the coast to the bottom of the elbow.

Apud shoal is a rocky shoal which uncovers in parts at low water and extends one mile W. and two miles N.N.W. of point Apud.

Point Makoto is of moderate height, steep, with a flat crown, and is surrounded by a reef. A rocky shoal, half a mile in diameter, and covered by 3¾ fathoms, lies one mile N.W. of the point. This shoal may generally be distinguished by the green and white colour of the water above it. There is an islet south-east of the point united to it by a reef.

The bay to the eastward of point Makoto offers anchorage sheltered from the north and west. Care must be taken in entering it to avoid a reef which projects from point Badian, the south point of the bay.

Point Kadburauan or Panguiran is low, wooded, and surrounded by rocks to a short distance with a depth of 4½ fathoms near them.

Tides.—In the gulf of Ragai the flood stream sets to the north, and the ebb to the south. The range of tides at springs is 5½ feet.

BURIAS ISLAND, at the entrance of the gulf of Ragai, is a long narrow island, 37 miles long. N.W. and S.E., and about 6 miles wide in the middle. It is roughly mountainous, and thinly wooded; it is commanded by the lofty mountain Engañoso, situated nearly in the centre of the island, and showing a cleft that divides the high land of the northern part of the island from the very low land of the southern part. The coasts are in general steep, and bordered in places by sand beaches. The island has two sheltered ports: Busin, at the north-west end, formed by Busin island lying in front of a bay in the coast, and Busainga on the north-east coast of the island.

Burias island and the islets and reefs in its vicinity have not yet been thoroughly surveyed. The population is sparse, and only amounted in 1875 to 11,000 people. The main productions are rice, maize, and *abaca* (Manila hemp).

There are several small islets and reefs off the northern part: Templo, 2½ miles N.W. of point Cueva, the N.W. point of Burias, is 3 miles long north-west and south-east, and 1½ miles wide. There are detached rocks on its south side, and its north point is surrounded by a reef of half a mile width. Sombrero, 1½ miles west of Templo, consists of two islets close together on a reef which extends a mile to the north-west and south-east of them. Arena, 7 miles S.E. ½ E. of point Arena on Bondog peninsula, is surrounded by a reef which grows out three-quarters of a mile to the northward. A shoal, separated from this last-named islet by a channel three-quarters of a mile wide and 12 fathoms deep lies 1½ miles to the north of it.

Busin island is 2½ miles long and one mile wide. A shoal projects from its north-west end to the islets Tinalisayan, and unites with the reef that surrounds the little island Tanguigui 4 miles north of point Cueva.

Detached shoals.—One mile north of Tanguigui there is a rocky head covered by 3½ fathoms of water with 75 fathoms immediately north of it; and about 2 miles N. of the northern end of Burias there is a rocky shoal half a mile in extent, having less than a fathom over it.

Anima Sola is an islet 4½ miles N. 40° E. of the N.E. point of Burias, surrounded by rocks.

Port Busin* is formed by the channel 3½ miles long and

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* *See* Admiralty plan:—Ports in the Philippines, No. 2,395; scale, $m = 1·4$ inches.

1½ cables wide that separates the island Busin from Burias. The western entrance of this channel is narrow and tortuous, and very dangerous for a sailing vessel; the northern entrance is preferable, as, though narrow it is more direct, and its sides are steep-to. In a working breeze a vessel can keep well in mid-channel. The northern entrance may be easily recognised by the north cape of Burias, point Colorada, which is higher than Busin island, and shows yellow patches among the trees that cover it. The part of the coast also near the entrance may be recognised by the massive bluffs about it.

LIGHTS.—In the Spanish list of lights a *fixed white* light is shown on point Colorada, and another on the north-west point of the channel; but these lights are not maintained by the government, and are therefore not to be depended upon.

Anchorages.—The best anchorage is west of fort San Pascual, at the entrance of the bay that opens to the south, on the coast of Burias. The depth at the entrance of this bay is 11 fathoms, lessening to 2½ fathoms, at half a mile within the bay.

Fresh water can be obtained here.

Coast.—Between port Busin and port Busainga, 3½ miles to the S.E., the coast forms a bay, from the western point of which a reef projects to the northward for one mile with 9 fathoms near its northern edge, narrowing in to the coast again at the northern point of port Busainga.

Port Busainga* is an inlet one mile long and one cable wide, including some bays which afford good holding ground in depths of 8 fathoms, sheltered from wind and sea. The wide space at the bottom of the port is shallow.

LIGHTS.—The Spanish list of lights gives a *fixed blue* light on point Piedras, the north-western entrance of the inlet, but it is not mentioned in the Spanish Derrotero, and as it is not an official light it must not be depended on.

Tides.—It is high water, full and change, at 0h. 30m. Springs rise 5½ feet.

East coast of Burias.—The bay, 5 miles long S.E. by S. of port Busainga, appears to be filled with shoals; the remainder of the coast to the southward presents beaches off which there is anchorage on the open coast.

West coast of Burias.—Point Cueva, the north-west point of the island, is surrounded by a shoal 2 cables wide, from which a reef extends to point Guinduianan, 6 miles to the southward, advancing in some places to a mile from the coast. The remainder of the west coast is sandy, with shoals at no great distance from it, especially in the bend of the coast called Boca Engañosa (false entrance) at the foot of the slope of mount Engañosa, which is the highest hill in the island. The little islet Gorion is in this bend.

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* *See* Admiralty Plan; Ports in the Philippines, No. 2,395; scale, $m = 2$ inches.

Caution.—When approaching Burias island from the westward in thick weather, such as occurs in the S.W. monsoon, the southern part of the island, which is low, may be hidden, and the slope of Mount Engañosa may be mistaken for it, and Boca Engañosa for the passage between Burias and Masbate, a mistake which has caused the loss of many vessels, and has given rise to the name 'False.' This error may be avoided by bearing in mind that the middle of the low part of the southern land of Burias is in line with Albai Volcano in Luzon on the bearing N. 38° E.

SOUTH COAST of LUZON.—From point Kadburauan the coast trends E.N.E. for 6 miles, and is foul; the islet Lanuyan, distant one mile from the coast, is united to it by a reef which dries at low water. The coast then bends round to the S.E., and becomes lower towards Marigodon, which is rocky and steep with a flat top. There is anchorage between point Marigodon and the town of the same name to the northward. From this point the coast trends S.E. by E. for 8 miles to point Putiao, and is low with shelving sand beaches affording good anchorage off it.

Donsol river and town.—The river mouth is fronted by wide sand banks, which extend to one mile from the shore, with soundings of 13 fathoms at the edge, and 68 fathoms at half a mile distance. The bar of the river has only 3 feet of water over it at low water; within the bar a depth of 5 to 11 feet is carried for a mile up the stream. The town of Donsol, on the left bank of the river, near its mouth, consists (in 1879) of 4,682 inhabitants, and carries on a brisk trade with Manila—principally in abaca (Manila hemp) palm mats, and coco-nut oil. Steamers call about fortnightly.

Port Putiao is a large but shallow inlet, which can be entered by coasters only, and at high water; sand banks on both sides reduce the available width to one half, and at 2 miles from the mouth these banks unite, thus leaving only a depth of 3 feet here for communication with the inner port. The entrance points are one mile apart, and are both surrounded by reefs; the reef round the western point extending one mile to the S.E. The depth at the entrance is $2\frac{3}{4}$ fathoms, and at one mile further in it is $1\frac{1}{2}$ fathoms.

Palatuan bay, to the eastward of port Putiao, is shallow; the reefs on either side leaving only a narrow inlet 2½ fathoms deep. At the outer edge of the reefs the depth is 3 to 5½ fathoms.

Point Bantiki, the western point of the large port Sorsogon is rounded, low, rocky, and wooded, with a shore composed of gravel and clayey cliffs. On the southern extremity there is a vantay. The rocky shoal that surrounds the point is very narrow, except on the sipe of Palatuan bay.

PORT SORGOSON[*] is the largest and best harbour in the strait of San Bernardino, and is a good refuge in case of a typhoon or a *colla*, and for effecting repairs. The entrance is divided into three channels by the islands Malumahuan and Bagatao. The channel between these two islands is the only one practicable for vessels; the others between the islands and the coast being narrow and shoal. A narrow shoal stretches from Malumahuan island almost to the north coast of the port.

Bagatao island.—A bank of fine black sand, with soundings over it of 12 to 14 fathoms, stretches 2 miles S.W. of Bagatao island, and offers anchorage to a vessel caught by bad weather, and unable to reach the port.

The Boca Grande, or principal entrance, is 1¼ miles wide, and irregular in depth—from 9 to 20 fathoms. The west coast of Bagatao island is clean; the bottom on the Malumahuan side is shelving, with a depth of 4 fathoms at a distance of 2 cables to the east of that island. The channel is nearly 6 miles long N.E. by E., with irregular depths of 8 to 20 fathoms as far as point Makugil, on the southern shore. A rocky shoal, covered by one fathom, projects off this point 1½ cables N. by E. The coasts and islands on both sides of the channel are clean, and the sea faces of the islets on the north side are steep-to, so that a vessel keeping in mid-channel is clear of all danger.

The inner port of Sorsogon is spacious, extending 9 miles E.N.E. towards the town of Sorsogon, of 10,000 inhabitants, with depths, diminishing gradually from 9 to 2½ fathoms.

Anchorage.—Once past Bagatao island a vessel can choose the anchorage suitable to her draught, but if she draws much water it is best not to make for the town of Sorsogon, as a depth of 3½ fathoms is reached at 4 miles from it. H.M.S. *Sphinx*, in 1861, anchored north of Bagatao island in 8 fathoms, with Tinakos island bearing S 83° E., and Tumalaitai fort N. 16° W.

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[*] *See* Admiralty Plan, Ports in the Philippines, No. 2395; scale, $m = 2{\cdot}0$ inches.

Supplies.—There are many towns on the shores of port Sorsogon, and beef, poultry, rice and vegetables are all procurable. Horsburgh says that water is to be had on the eastern side of the harbour.* Steamers from Manila visit the port about twice a fortnight.

Coast.—From the southern point of entrance to port Sorsogon the coast trends S. by E. for 13 miles to point Bulak, and shows broken ground in some places, though in general the shore shelves gradually into the sea by sandy beaches, before which vessels can find good anchorage. At 5 miles from Bagatao island, according to the Spanish Derrotero, a scarped hill can be distinguished which indicates a place where a bank covered by 5 feet of water projects to one mile from the shore.† All this coast shelves out to 2 or 3 miles, with soundings of 15 fathoms at 1½ miles, and 30 fathoms at 3 miles.

Bulan river and **town.**—The town of Bulan (formerly known as Gata) is situated on the right bank of the river which debouches south of point Bulak, and consists of 2,500 inhabitants. A *vantay* is erected on the sandy point of Bulak. The depth on the bar of the river is 4½ feet at low water, and greater up stream. Coasting steamers call here.

Angas point, 2½ miles S.E. of point Bulak, is high; Otake bay, included between the two, shows a sandy beach and is 2½ to 10 fathoms deep.

Butag bay, east of point Angas, is about a mile wide, and runs one mile in to N.E.; reefs extend from the points on both sides. The depth of water at the entrance is 14 to 16 fathoms, and in the middle of the bay 14 fathoms. The shores are wooded and in some places of considerable height.

Marinap bay, the next bay to the eastward of Butag, is capable of containing vessels of good draught. The shores are sandy in some places, and covered with mangroves in others.

Between the southern point of Marinap bay and point Tagiran the coast is slightly indented with little bays clean and deep, but not running far inland and offering but little shelter, with soundings of 25 fathoms near the intermediate points.

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* Horsburgh, Vol. II., 8th edition, p. 520.

† This description would indicate point Inaran, which however, is 9 miles S. by E. of Bagatao island on the Spanish chart, though the Spanish Derrotero says 5 miles. The names of the points and bays on the south coast of Luzon, between port Sorsogon to the west and Magnok to the east described in the Derrotero of 1879 are, however. but incompletely given on the Spanish chart of 1873. Point Bulak is not even named on the Spanish chart.

Tagiran point, 9½ miles from point Bulak, is a remarkable little hill, apart from high mountain range behind it, with a flat top on which is a plot of green clearer than the rest of the hill, and which can be seen at a great distance. There are three or four detached rocks about 40 yards from the point with 5 fathoms of water close to them, and 13 fathoms at a short distance. A rivulet falls into the sandy creek on the east side of the point.

Tides.—In the channel between this coast and Tikao island the tidal streams run with a velocity of not less than 4 knots.

TIKAO ISLAND is 23 miles long N.W. and S.E., and 6 miles wide at its northern end, narrowing towards the extreme south point, San Rafael, from which a chain of islets and rocks extends towards point Vigia in Masbate. The island is mountainous, and but thinly populated. It possesses two ports San Miguel and San Jacinto, neither of them very good.

Port San Miguel* is one mile wide at the entrance, and open to the N.W.; the depth of water is 50 fathoms at the entrance and 45 to 25 fathoms within, but the plan shows very few soundings. The shores of the port are very steep, but a reef with three islets on it extends from the middle of the western shore to 3 cables N.E. of the eastern islet; the reef is hidden below water and a part of it fringes the southern part of the bay.

This port offers convenient anchorage in thick or bad weather, or to a vessel embayed under the islands San Miguel, and unable to reach port San Jacinto, or the anchorages off Masbate.

The three islets which form a prolongation of point San Miguel are very steep-to, but must be kept at a distance, as vessels are liable to be drawn towards them by the tides.

Tagdugan bay, 7½ miles S.E. of point San Miguel is open to the N.E. and is skirted by a narrow reef which extends 2 miles to the N.W. and fringes the coast to port San Jacinto, 3 miles S.S.E.

Port San Jacinto† is small and open to the east, but has good holding ground; the entrance may be recognised by a fort with rounded bastions on the southern point, with some conical hills behind it. The narrow bank that fringes the coast continues round the inside of the port, and the 3½-fathom line of soundings passes within 3 cables of the northern point (named San Antonio on the plan and San Francisco in Spanish Derrotero), and within 1½ cables of the southern point (San José), reducing the actual width of the available harbour to about 3 cables. The depth of water lessens gradually from 16 fathoms at the entrance to 3 fathoms, mud, at the edge of the shoal of sand and mud at the bottom of the port. The town is on the point near the fort and numbers about 300 houses, containing 2,000 people.

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* *See* Admiralty Plan, Ports in the Philippines, No. 2391, scale, $m = 2$ inches.

† *See* Admiralty Plan, Ports in the Philippines, No 970, scale, $m = 3{\cdot}9$ inches.

Anchorage.—The best anchorage is on the southern side in 9 fathoms, with point Cosme bearing N.N.E. and the church and fort of San José S.E. by E. ¾ E. Vessels arriving off the port at night, and not caring to venture in, may anchor before the port in 10 to 24 fathoms, but the anchor should be let go as soon as soundings show 24 fathoms, as the bank is very steep-to.

Water can be obtained at the wells and also at a river near.

Tides.—It is high water, full and change, at 6h. 30m.; springs rise 6 feet: the tidal stream is very weak.

Coasts.—The east coast of Tikao presents many little bays open to the east, in which anchorage can be had, as well as on the sand bank that borders the coast, and which extends out about a mile from Biton bay to point San Rafael. The west coast is steep and rugged, and has no good anchorage; a depth of 5½ to 7 fathoms is found along the entire coast at a short distance from it.

PASSAGES BETWEEN TIKAO and MASBATE.—A chain of islets and rocks with channels between them extends from San Rafael, the south point of Tikao to point Vigia in Masbate, 8½ miles S.W. The most practicable of these channels (named in the spanish Derrotero Negrito Head passages), are one between the islet Matabao, next to Tikao, and Black Rock; and one between Black and Makaragui; the first of these is one mile wide and 36 fathoms deep: the second is much wider and 27 fathoms deep.

Matabao.—From the east coast of this island a bank of sand extends 1½ miles to the north-east, with 1¾ fathoms least water over it, and 8 fathoms near the edges. The narrow channel between this islet and Tikao has a depth of 8 to 11 fathoms.

Black Rock, or Cabeza de Negrito is a cluster of rocks which covers at high water: it is steep-to with 14 fathoms water alongside.

The channels between Makaragui and Deagan and the intermediate islets are of no importance; the channel between Deagan and point Vigia in Masbate is 4 or 5 cables wide, and 4½ fathoms deep. The tidal streams run very strong through these channels, reaching a velocity of 3 to 5 knots at springs, with violent eddies.

NORTH-EAST COAST OF MASBATE.

Point Bugui.—The northern extremity of Masbate is very high, rugged, and steep-to, and can be passed close to in 7 or 8 fathoms water; from the point the coast trends E.S.E. for 9 miles as far as port Barreras, and is clean and bold.

Port Barreras* is capacious, with good holding ground. The surrounding land is mountainous, of a red colour, and furnishes excellent wood for building; the shores are covered with mangroves to the water's edge. Point Colorada, the western entrance point, may be distinguished by its red cliffs; a ledge of rocks projects 3 cables to the eastward from the point, with 4½ fathoms at its edge. An islet surrounded by rocks lies off point Kadbatan, the eastern entrance point.

The depth of water in the middle of the port is 18 to 24 fathoms, bottom coarse sand, but it decreases to the westward and the bottom becomes rocky; reefs extend from the western and north-western shores to a distance of 8 cables. On the south side of the port a creek, into which a river enters, penetrates 2 miles inland, the entrance is 3 cables wide, and 4½ fathoms deep, but within the depth decreases to 1¾ fathoms near some islets.

The town of Arroroi is near the eastern entrance point.

Anchorage.—There is good anchorage in 22 fathoms, coarse sand and mud, off the inner end of the sand beach of point Colorada, which is steep-to, and also in the entrance of the port with the point bearing north, in 24 fathoms.

Water.—There is no convenient watering place on the shores of the port, water may be procured from up the river.

Port Magdalena, 9 miles south-east of port Barreras, is very small, and open to the N.W. but is considered an excellent anchorage safe at all seasons, vessels can secure with hawsers to the trees of the inner part of the port, and although they might be blown upon the mud by the few winds to which the port is exposed they would receive no damage. The anchorage is surrounded by high land covered with impenetrable wood. There are reefs around both exterior points particularly the one to the northward. The depth of water is 20 fathoms at the entrance, lessening to $3\frac{1}{4}$ fathoms before the village at the bottom of the port where there are some shoals near the beach.

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* *See* Admiralty plan, Ports in the Philippines, No. 2,391, scale, $m = 2{\cdot}0$ inches.

Supplies.—Vegetables, poultry, and honey are all that can be had here ; water can be procured from two rivulets, but it must be taken from a long way up, as it is not fresh near the port. The town of Balino, of 1,700 inhabitants, is $1\frac{1}{2}$ miles west of the port.

Port Palanog,* 6 miles to the S.E. of Magdalena, is small but deep, and well sheltered from all winds. The entrance is only 3 cables wide, and great care must be taken to clear the reefs at both points, especially that at the S.E. point, which extends nearly to the middle of the entrance. In entering the port keep nearer to the north-western point than the opposite one, as the reef only extends a third of a cable from the former, but bear in mind that within the port the reef projects a great deal farther out from the shore. In 1874 the steamer *Dagupan* grounded on the reef off the north-western shore within the port. The interior is, in fact, lined by reefs, and there is an extensive shoal on the south-western side of it. The depth at the entrance is 18 fathoms, lessening regularly to $4\frac{1}{2}$ fathoms at the edge of the shoal above mentioned.

Anchorage.—The anchorage is on the east side of the port, before the town of Palanog, in 17 fathoms, at 2 cables from the beach.

Mobo bay, south-east of Palanog, is 2 miles wide, but almost completely closed by the bank Pontud, which leaves but a narrow entrance channel 8 to 12 fathoms deep. A little river runs into the southern part of the bay, on the bank of which, at less than a mile from the mouth, stands the town of Mobo, of 1,500 inhabitants. The land round about it is hilly and very fertile.

Uson and **Naro bays.**—Between point Paniki, 8 miles south-east of Mobo bay, and point Vigia, 7 miles to the westward of Paniki point, the coast forms two bays, Uson and Naro, both open to the north-west, and separated by a broad hilly headland, point Tabunan, which advances 3 miles in the same direction from the coast. A bank of sand, with 7 fathoms at its edge, extends half a mile out from the northern extremity of this headland, and fringing the coast to the westward, half fills up Uson bay. This bay is one mile wide and two miles long, with a depth of 14 fathoms at the entrance, lessening to $2\frac{1}{2}$ fathoms near the shoal that fills up the southern half.

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* *See* Admiralty plan, Ports in the Philippines, No. 962 ; scale, $m = 3\cdot70$ inches.

At a short distance from the bottom of the bay is the town of Uson. Naro bay is clearer and deeper than Uson bay, having 18 fathoms at the entrance, and 7 fathoms at the mouth of a small river within the bay, near the mouth of which is the town of Naro.

Point Vigia (San Gabriel on the old charts), the eastern point of Naro bay, has on its western side, at a mile's distance from the coast, a little islet, clean on the off side, with 18 fathoms close to it. On the eastern side of the point there is a shoal which extends nearly a mile out, and fringes the coast to the southward for 3 miles as far as point Taguejan, where it narrows in to the coast. The channel between point Vigia and Deagan island to the northward is 4 cables wide.

The EAST COAST of MASBATE, from point Vigia to point Kaduruan, the south-east extremity of the island, is clean with depths of 4½ to 8 fathoms at a short distance from it.

Port Kataingan,[*] 20 miles S.S.E. of point Vigia, is a clean and capacious port, open to the S.E., of good depth of water and good holding ground; it is 1¼ miles wide, and extends 4½ miles N.N.W. in the direction of the Tetas de Kataingan. Badlai island lies one mile S.S.E. of the eastern entrance point, and is surrounded by a narrow reef. Ordonez shoal, covered by 5½ fathoms, lies S.W. by S. of the eastern entrance point, very near the coast. The channel between Badlai island and the point is 16 fathoms deep, and between Badlai and Ordonez shoal is one mile wide and 23 fathoms deep.

On the eastern side of the port the bottom is rocky, and there are three isolated shoals. The first of the three is a circular shoal of rock nearest the entrance, 2½ cables in diameter, with 1½ to 2¾ fathoms on it, and 11 between it and the shore. The second shoal lies N. 40° W., one mile from the first and 2½ cables from the shore; it is very small, and has 1¾ fathoms on it. The third is nearly 3 miles from the entrance and 1½ cables from the shore; it is 1½ cables long N.W. by N. and S.E. by S., and very narrow, and it has a depth of less than a fathom over it. The bottom of the port is sandy on the western side; the northern part of it is shallow, and at 3 or 4 cables from the end of the bay the depth is only 1½ fathoms.

Anchorage.—The anchorage is half a mile south-east of the town of Kataingan at the end of the port in 4½ fathoms.

Bugtun and **Balanguingui islands.**—These islets are clean, of unimportant height and steep-to; the channels between them and the coast of Masbate appear safe and deep.

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[*] *See* Admiralty plan:—Ports in the Philippines, No. 962; scale, $m = 3{\cdot}70$ inches.

ISLANDS BETWEEN MASBATE and SAMAR.—The four islands, Tagapula, Mesa, Sibugai and Limbankauayan, along with the several smaller islets about them, are all high, clean and steep-to. The channels between them and the coasts of Masbate and of Samar are wide, and the tidal streams in them are strong.

Tides.—The flood stream sets to the south, and the ebb stream to the north.

Maripipi island is a rounded mountain 2,989 feet high, covered with trees; the sides are clean and very steep-to. The islets Sabanbua are four rocky islets close together, surrounded by a shoal of sand, there are rocks (Lajas) to the north of them.

BILARAN ISLAND, on the northern coast of Leite, is about 20 miles long N.W. and S.E., and 20 miles wide, high and mountainous. The highest peak is on the western side; the southern and south-eastern coasts are bordered by reefs which extend half a mile out.

Tagampul and three other small islets lie off the the north-west point of Bilaran.

Remus rock, 6 cables N.N.E. of Tagampul, is of small extent, covered by 13 feet least water; close to its northern edge there is 65 fathoms water, but in other directions the depths increase gradually from 5½ to 16 fathoms; between Remus rock and Tagampul islet soundings of 65 fathoms were obtained.

Bilaran channel, separating the island from the N.W. promontory of Leite, is 13 miles long, and has a width of 6 miles at its northern entrance; but at the southern entrance the width is less than a quarter of a mile. The sides of this channel are clean and steep-to; in the middle of the narrow part of the south-eastern entrance there is a rocky islet, opposite to, and to the north of which islet stands the new town of Bilaran, with anchorage in front of it in 5 fathoms, mud.

The NORTH COAST of LEITE is imperfectly known; Karigara must be a place of some trade, for steamers from Manila touch there about once a fortnight; but there is no other information about it to hand.

SAN BERNARDINO STRAIT.—San Bernardino strait, which separates the south-east extreme of Luzon from the north-west part of Samar, is so named from the small islet which lies in its eastern entrance. It was formerly the great highway for the Spanish galleons on their way from Manila to Acapulco in South America. The latest survey of the strait was in 1804, when Captain Don Juan Vernacci, commanding the *Magallanes*, constructed the chart between point San Miguel in Tikao and Katarman in Samar.

South point of Luzon.—From Tagiran point the coast trends eastward for 6 miles, forming a succession of sandy bays of no great indentation, with small rivers emptying themselves into them. The depth of water in these bays is very great. The little port Bunut, east of point Langao, is the outlet of a river which flows from a ravine between two high mountains. The depth at the mouth is 15 fathoms, and 4 fathoms further in ; over the bar of the river the water is so shallow that boats can only enter at high tide.

Point Bunut, on the eastern side of the port, is not so high as the adjacent land, but is distinguished by a table-top with a *cogonal* upon it ; the other points are covered with trees to the water's edge. From this point Bunut to point Babatgun the coast is rocky.

Babatgun anchorage is a semi-circular bay included between point Babatgun to the west, and point Kulasi to the east ; on the western side of the bay there is a small sheltered creek with very steep shores, a depth of 4½ fathoms being found at less than 12 yards from the shore. The west point of the bay is rocky, with a reef projecting to some distance from it. Care must be taken to avoid this reef as the flood tide from the Tiklin channel sets directly on to it. The depth of water between the two entrance points varies from 18 to 4 fathoms, while from the centre of the bay towards the above-mentioned creek the soundings are 17 fathoms to 14 not far from the shore.

Kalantas bank, bearing S. ½ W. 2 miles from point Kulasi, is formed of large black rocks and coral. The northern head is a flat rock 5 feet above water, with 8 fathoms water near it; the depth increases at a short distance to the northward. The shoal extends south-east from the flat rock and at a distance of one mile the depth is 8 fathoms ; from here it augments rapidly to the southward. The tidal streams cause heavy breakers on the bank, giving it the appearance of a white sandy islet.

Tiklin strait is the channel between the coast of Luzon and the islands Kalintan, Juak, and Tiklin. Although this channel is sufficiently deep, it is not safe for a large vessel to pass through on account of the tidal streams and eddies in it. The western shore of the strait, between points Kulasi and Pandan, is composed of broken coral covered by mangroves, and fronted by a reef half a mile wide with 3½ fathoms depth at the edge of it. Shelter may be found if required in Kulasi bay, which lies between Kulasi point and the island to the northward of it.*

Magnok bay† is a small bay open to the eastward fringed by a narrow reef with 3 to 4 fathoms water near the edge; the plan shows a depth of 8 fathoms in the middle of the bay. On entering, care must be taken to avoid a rocky shoal covered by 1½ feet at low-water, which extends to half a mile N.N.E. of the southern point of the bay. During easterly winds the bay is not safe, as a heavy reef breaks within it. The town of Magnok on the north side of the bay is poor, and offers few resources.

ISLANDS IN SAN BERNARDINO STRAIT.—Tiklin islands.—Kalintan, the southernmost of the group, lies half a mile south-east of point Kulasi in Luzon, and is one mile in length N.E. and S.W.; Juak, north-east of Kalintan and only separated from it by a narrow channel is 2½ miles long north and south: both islands are rugged and covered by ebony trees. There is a small detached rock about 1½ cables distant from the south-east shore of Kalintan.‡ Tiklin, which gives the name to the group, lies two-thirds of a mile south-east of point Pandan in Luzon, but the available channel between them is reduced by reefs on either side to a width of 2 cables. The island itself is half a mile in length, north and south, but a shoal projects from the south point half-way towards the island Juak, which ends in a rock awash with 2½ fathoms water near it, leaving between it and Juak a narrow channel fit only for small coasters. Good anchorage may be had at a distance of 2 miles south-west of Tiklin.

Naranjos islands are a group of six, lying close together, about 7 miles to the southward of the south point of Luzon; they are named respectively San Andres, Rasa, Medio, Darsena, Aguada, and Escarpada; a seventh island, named Destacado ("Detached") lies 3½ miles south-east of Aguada. These islands are mostly of moderate height and rocky; their shores are rugged with occasional sand-beaches; the channels between them are clear and practicable for vessels of all sizes; but it is not safe for a sailing vessel to use them, on account of the variability and strength of the currents, and the shifts of wind experienced among them; besides which, each island is surrounded by a narrow reef projecting furthest from the salient points of the islands. The soundings between the islands vary between 9 and 27 fathoms, so that a vessel could anchor in case of need, but the bottom is rocky.

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* Named Burung-burungang; the name of this unimportant island is omitted on the chart for want of space.

† *See* Admiralty plan, Ports in the Philippines, No. 2,395; scale, *m* = 1·4 inches.

‡ Lieutenant A W. Torlesse, H.M.S. *Lily*, 1881.

The channel between Naranjos group and Kapul island has not been surveyed; there are no dangers visible in it.

Kapul island, lying 3 miles S.E. of Kalintan island, is about 7 miles long N.W. and S.E. and 2½ miles wide, moderately high, the highest land being on the eastern side near the town Abak. On this part there are sand-beaches, but the remainder of the coast is rugged and steep, and it is not prudent to anchor near the shore.

Anchorage.—At about the southern extremity of the island there there is a little bay called Juban bay, with depths of 17 to 7 fathoms, which is probably the only place offering safe anchorage. On the west point of entrance there is a remarkable pyramidal rock which is useful as a guide.

Diamante rock, lying 2 miles S.E. of the south point of Kapul is small and very steep-sided. It is covered by ~~2½~~ fathoms least water, with 17 fathoms at its edge.

Clearing mark.—A vessel, compelled to pass between Kapul and Dalumpiri islands, may clear Diamante rock to the westward by keeping the S.W. tangent of Kapul in line with the highest part of the Sierra of Gata on Bulan, bearing N. 38° W.; and, by taking care not to open the channel between the islands Aguada and Escarpada, she will clear Diamante rock to the northward.

Dalumpiri or **Puercos** island is low, wooded, and bordered by sand-beaches, with rocks close to them. A rocky shoal projects from the southern point more than a mile to the south-east, covered by 4½ to 9 fathoms water, with 17 fathoms at a short distance. There is no danger in the way of anchoring off the island, but the water is deep, and the bottom rocky. The channel between Dalumpiri and Kapul is 2 to 3 miles wide, and clear of danger. Game is abundant, especially wild hogs (puercos). In the middle of the island there is a large lake swarming with alligators.

SOUTH-EAST COAST of LUZON.—**Bulusan town,** 10 miles north of point Pandan, is situated on the shore on the right bank of a river which takes its rise on the eastern slopes of Bulusan volcano. The inhabitants number about 35,300. The shore is fringed by a reef to the distance of half a mile in places, with 2½ to 7 fathoms on the edge.

Bulusan volcano, 5 miles distance from the coast, is a remarkable, active volcano, visible at a distance of 60 miles, and forming an excellent mark for making the strait. From the eastward it shows a single peak, but seen from the S.S.W. it shows two peaks.

San Bernardino islet, from which the strait takes its name, lies 7 miles from the coast of Bulusan. It is 150 feet high, and covered with trees, many of which belong to the ebony tribe. There is a smaller islet close to it to the north-north-east, and rocks and foul ground extend half a mile south-east from the island. On either side there is a channel 5 miles wide, with soundings of 30 to 60 fathoms. The chart shows a rock, position doubtful, about one mile N.W. of the island.

Gubat bay, 12 miles north of Bulusan, is bordered by reefs, and great reefs project some 2 miles out from the north and south points of the bay. The coast between Bulusan and Gubat is fringed with a wide reef, shown on the chart to extend 2 miles out from the shore in one place. The town of Gubat, of 9,600 inhabitants, is on the north-west side of the bay near a tongue of land which divides the bay into two. Steamers from Manila call here about twice a week, but we have no information about the anchorage.

Montugan reef is the great reef that fringes the shore from Bulusan to point Montugan ; its most salient part projects 3 miles to the eastward about 5 miles north of Gubat. The channels in the reef are used by coasters working their way to the gulf of Albai.

Point Montugan, the southern point of the gulf of Albai, and 9½ miles from Gubat, is very low and sunken, and surrounded by shoals. A reef projects 1½ miles out from it to the north-east, with 5 to 11 fathoms at its edge.

NORTH-WEST COAST of SAMAR.—Port Kanaguaion, on the west coast, opposite the south end of Dalumpiri island, is a small port in which vessels of all sizes can find shelter in bad weather. It is formed by an inlet in the coast, with two islets fronting it, leaving two narrow channels for entrance. The great pass, or Western channel, is 1½ cables wide.

The anchorage is between the islets and the coast of Samar, and offers good depth of water, and good holding ground ; but the space is confined. Water can be obtained from a rivulet opposite the first islet.

Coast.—Immediately south of point Kanuguaion the river Pinalet runs down and enters a little cove, steep-sided, with a depth of 6 fathoms near the shore. Point ~~Pinalet~~ Palanit, the southern point of this cove, is high and jagged, and has an islet off it at a distance of 50 yards. From this point the coast trends S.S.E. for 7 miles to point Malayo ; it is rocky as far as the intermediate point Maglagaban, and from thence to point ~~Malay~~o Malayok it is steep-to.

Mauo **~~Mobo~~ river**, 4 miles N.N.W. of Kanaguaion port, is fed by a beautiful waterfall which flows from a valley between two high hills of black rock ; its shores are covered by trees and nipa palm. The river is 100 yards wide at the mouth, but the available width is diminished to 25 yards by a reef from the south point. The waterfall is a third of a mile from the mouth of the river, and can be reached by a boat. The depth on the bar is 11 feet at low water, but within the bar it increases to 9 fathoms.

In this part of Samar the coasts form the base of a high range of mountains covered with trees of a very dark green. The hill consists of sand and rocks, covered with mangroves down to the water's edge. At a third of a mile from the shore the depth is 7 fathoms, sand and rock.

Kinabasaran point is covered with high trees ; the shore between the point and Mobo river is bordered with rocks, in some places to a distance of a quarter of a mile from the shore. The tidal streams, which run 7½ knots at springs and 4 knots at neaps, strike the point with great force, producing violent eddies.

Lipata point, 3½ miles north of Kinabarasan, is high and rocky. A reef of sand and rock covered by 5 feet of water, projects from the point. There is good anchorage during the N.E. monsoon in the open bay of Tinaguitan, between points Kinabasaran and Lipata, the depth of water in the northern part is from 27 to 13 fathoms ; and in this same part of the anchorage there is a good stream from which water may be obtained.

Balicuatro point, the N.W. point of Samar, is clean and steep-to to the northward, while to the southward and westward the shore is bordered by rocks to some distance out.

Balicuatro bay, to the eastward of the point is deep, and the shore is steep and fringed here and there with rocks. Vessels should not anchor in it except in case of need.

BALICUATRO ISLANDS, off the N.W. coast of Samar, have not been surveyed, and the channels between them are narrow and little known. A vessel should therefore take great precautions in entering them.

Vari island, $3\frac{1}{2}$ miles north-east of point Balicuatro, is 4 miles long and 3 miles wide; its shores are clean and steep-to, except to the south and south-east where a reef extends three-quarters of a mile out. A detached rock lies to the north of Vari island, half a mile off.* Irregular depths of 7 to 36 fathoms extend to 20 miles west of Vari island. The bottom is rocky, and the tidal stream strong, so that vessels anchoring there are liable to lose their anchors.

Kinamaligan is low and surrounded by a reef; the channel, this island, and the reef off the coast of Samar are a third of a mile wide and 5 to 15 fathoms deep; the soundings increase abruptly to 27 fathoms to the eastward.

Kabaun, the easternmost of the Balicuatro islands, is low, wooded, and surrounded by a reef which extends to more than a mile from the shore. There is anchorage between it and the coast of Samar, completely sheltered, but, at the same time so surrounded by islets, dangers, and sand-banks which make it difficulty of access. The channels leading to it are only known to the local pilots.

Katadman anchorage is fit for coasters only, and only for them during the S.W. monsoon, as, during the N.E. monsoon a very heavy sea sets in. The town of Katadman, on the left bank of the river of the same name, contains a population of 8,200 souls.

The coast of Samar is very foul to the eastward of Katadman. The islets Hirapsan and Palijon 4 miles from the coast, appear to be united to it by a reef which continues along the coast as far as point Oot. From point Livas, 4 miles east of Oot, there are rocky islets covering a distance of half a mile to the northward.

Laguan bay,† between Livas point and the western side of Laguan island, offers good anchorage in 6 or 7 fathoms, sheltered from east and north-east winds, but exposed to the north-west and west. The depth of water diminishes gradually from 7 fathoms at the mouth of the bay to one fathom at a little less than a mile from the shore at the head. The south-eastern part of the bay is rocky.

Laguan island is separated from the coast of Samar by a narrow channel which communicates with port Palapa. The town of Laguan stands on a slight eminence on the south-west shore, and has a population of 8,800 persons. A reef stretches out 6 cables from the middle of the western shore of Laguan island; in order to avoid this danger (when navigating to the northward from Laguan bay) the islet off the north-west point of Kahayagan island should not be brought to bear westward of north untill the reef is passed.

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* Lieutenant A. W. Torlesse, H.M.S. *Lily*, 1881.

† *See* Admiralty plan :—Ports in the Philippines, N. 2,395; scale, *m* = 1·12 inches.

Kahayagan island is surrounded by rocks which extend out 7 cables from the N.W. part.

PORT PALAPA,* formed by the channel that separates the islands Laguan and Kahayagan from Batag island, is about a mile wide, sheltered from all winds, and carrying a depth of water varying from 5 to 10 fathoms, bottom sand and mud. The reefs and shoals that fringe the shores are steep-to. The northern entrance is 6 cables wide and 12 to 23 fathoms deep between the reefs on either side; the eastern entrance is of the same width, and 12 fathoms deep. The channel between Laguan and Kahayagan island is 3½ fathoms deep, but too narrow to be navigable by vessels of any size.

Within the port, on the coast of Batag there is an open bay with two shoals in it lying north and south in line with the entrance points; these shoals are steep-to, with a depth of 5½ to 7 fathoms water around them. No soundings have been taken in the bay. Kalapan islet, in the elbow of the port opposite the S.W. point of Batag, is surrounded by rocks, and from this islet the Laguan shore is bordered by reefs as far as point Nakapol; the Batag shore is clean and very steep.

Anchorage.—Vessels can anchor anywhere inside the port, as most convenient to them. If intending to anchor off the entrance of Kalomatan river on the eastern extremity of Laguan island, care should be taken to well open the mouth of the little channel (3½ to 4½ fathoms deep) that leads to it, until the shore reefs of the river mouth can be seen. Before entering this channel with vessels of any size, it would be well to buoy the shoals. On the main coast south of the channel there is an inlet with several little islets in it.

Good water can be obtained from Laguan island.

Tides.—In port Palapa it is high water full and change at 7 h. a.m.

Batag island.—The north coast of this island is fringed by a reef which projects half a mile to the westward into the north entrance channel. A reef projects 4 cables to seaward from the S.E. point, narrowing the eastern entrance. The remainder of the outer shore of the island is clean.

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* *See* Admiralty Plan:—Ports in the Philippines, No. 2,395; scale, $m = 1{\cdot}12$ inches.

Bakan island, 3 miles east of port Palapan, is high, and appears to be clean and steep-to. It is separated from the coast of Samar by a channel 2 cables wide.

Winds in San Bernardino strait.—The S.W. monsoon generally begins in the strait of San Bernardino about the middle or end of April, with winds from S.W. and West, which at times blow fresh, and alternate irregularly with N.E. winds. They are first felt in the part included between Verde island passage and the meridian of Marinduque island, and in this part they blow stronger than the variable winds from north to south through east that are experienced further to the eastward, and which are accompanied by thick weather and heavy squalls.

In April and May the winds are variable from north to south, through east, with thick weather, rains, heavy squalls, and occasional calms; this weather continues through June until the S.W. monsoon becomes established in the neighbourhood of Verde island Passage, having beaten back the N.E. winds.

In general the S.W. monsoon becomes established in all its force during June, and blows from S.S.W. to West, reaching at this time as far eastward as Marinduque island. These winds bring rain at Manila and the west coast of Luzon.

In some years the S.W. monsoon is limited to the few gales from the westward alternating with the variable breezes from the eastward, which facilitate entering the strait from the eastward. In other years it attains its full force in May, and in this case the S.W. winds are less permanent from June to September, and are replaced by longer intervals of variable breezes.

The N.E. monsoon commences towards the end of September or beginning of October. During September the wind blows alternately from N.E., S.E., or S.W.; but with most persistance from S.W.; during the interval of change there are light winds, calms, and tornadoes.

During October, November, and the early part of December the monsoon blows with strength from north and N.E., accompanied by thick weather and rains. This is the worst season of the year for navigating the strait, on account of the bad weather, and the occurrence of typhoons. After the middle of December the gales cease, and the winds blow strong from N.E., East, and E.S.E., with much thick weather and rain until the March equinox, from which time until the monsoon ends the winds vary from north to south through east, sometimes blowing with force, and at other times light with variable airs and calms.

Typhoons occur at the change of monsoons, and especially at the commencement of the N.E monsoon, and few years pass without one happening in October or November. The signs preceding these storms, and the description of them will be found in Chapter I.

Tides.—In the absence of more definite information, the points on which the pilots are mostly agreed are: that in the channel the water begins to rise at about 2 hours after the moon is up; that the greatest rise and fall is 8 feet; that from the eastern mouth of the strait to about the meridian of Bondog the flood stream sets westward, and the ebb eastward; and that from that meridian to the Verde island passage, the reverse of this takes place. That, from the eastern mouth of the strait to the above meridian, the stream of flood runs longer than that of ebb in the N.E. monsoon, the reverse being found in the S.W. monsoon, and the opposite condition to this is found from Bondog westward, and finally, that the night tides are commonly higher than those of the day.

Tidal streams.—The flood-stream sets through the strait to the southward with great force, amounting sometimes to 8 knots an hour in the narrow passages between the islands, and causing strong eddies and overfalls among them. Within the strait it spreads out, following the passages between Samar and Masbate to the southward and between Luzon and Masbate to the northward, losing its force as it advances westward and encounters the stream which has entered through the western channels.

A counter-current of no great width is formed on the north coast of Samar, which runs from west to east along the coast and rounds cape Espiritu Santo to the southward.

DIRECTIONS for SAILING VESSELS TAKING THE STRAIT of SAN BERNARDINO DURING the S.W. MONSOON.—From West to East.—To pass out to the eastward from a position south of Marinduque, a course should be steered to make the N.W. point of Masbate island, to avoid being embayed with a south-west wind in the Boca engañosa of Burias island. A mid-channel course should be steered between Burias and Masbate, and when the S.E point of Burias is passed steer a N.E. course to pass north of Tikao, giving the islands San Miguel off the north point of Tikao a good berth on account of the strength of the tidal streams near them. Having cleared these islands it is well to keep to windward in order to be able to anchor at San Jacinto if required, to await daylight.

If the wind is settled and the time of day suits, vessels should not anchor at San Jacinto, but steer for Andres island, the north-western of Narangos, and thence pass midway between Kapul island and the Tiklin islands, passing out of the strait between San Bernardino islet and Vari island off the coast of Samar.

If the S.W. wind is not settled, it is well to remain at San Jacinto until it is fixed, lest calms or light winds should leave the vessel at the mercy of the tides in the strait. The best time for leaving the port is at half-flood, for then a vessel is likely to get the first of ebb when she is near Naranjos islands. In steering a course attention should be paid to the set of the tide.

If carried into the neighbourhood of Kalantas bank, it would be well to make for the coast of Luzon, where anchorage may be had, or to anchor on the bank in good time. The navigation of the strait requires great care, and an anchor should always be ready to let go.

From East to West.—When entering the strait from eastward in the S.W. monsoon, a vessel should work to windward with the flood stream, and when this loses its strength, should make for the bank north-west or west of Vari island, where anchorage can be had on sandy bottom until the tide makes again. On weighing, a vessel should work according to the direction of the stream, so as to pass between Kapul and Dalumpiri islands, or between this last and Samar.

If the tide should turn before a vessel has entered these passages she cannot do better than make for Tinaguitan bay, south of Lipata point in Samar. Anchorage can also be had, if necessary, in the channel on either side of Dalumpiri on a sandy bottom strewn with big stones.

The only danger to guard against at this part is the Diamante rock; this once passed, a vessel can take either the passage between Naranjos islands and Kapul, or between Naranjos and Destacado. This latter route is the best, shaping the course then to pass round the north end of Tikao island.

WEST COAST of SAMAR.—The part of the coast between Balicuatro point, the N.E. extremity of Samar, and Malayo point, some 21 miles to the southward, has been included in the description of San Bernardino strait. From point Malayo, the coast trends S.E. ½ S. for 15 miles to point Hibatang, west of Kalbayok; this part of the coast is high and clear.

Kalbayok town and anchorage.—The town is situated on the shore in a bend of the coast near the mouth of the river Kalbayok, and its population in 1879 amounted to 15,200 persons. The anchorage is opposite to the town, about a mile from the shore, with the church bearing N.E. by N. in 3½ to 4 fathoms water. It is not a good anchorage during the S.W. monsoon. Steamers from Manila call here fortnightly.

Coast.—From Kalbayok, the coast trends S.E. for 25 miles as far as Katbalogan, and is broken up into bays with little depth of water in them, and quite exposed to the S.W. winds. The rivers that flow into these bays can only be entered by small coasters at half-tide. Near the coast the water is shallow, in no place exceeding a depth of 4½ fathoms a few islets and banks that lie off it are separated from it by shallow channels.

The Libukan islands are a group of three islands and several smaller islets lying about 4½ miles off the coast of Samar. There is good anchorage in a bay on the north side of the largest island, Libukan Dakó, in 12 fathoms water, and vessels on the coast make for this anchorage when the S.W. gales, called *collas*, begin to blow. Two islets named Layalaya, united by a reef which dries at low water, lie one mile S.E. of the largest island.

Dangers.—A shoal, awash at low water, lies 7 cables S.W. of Libukan Gutiai; and Dapdap shoal, which uncovers at low water lies 9 cables S. of Layalaya islets. Kambidsos rocks lie 1¾ miles east of Dapdap shoal, and one mile north of the largest Kanahauan island.

W. 7 S

The Kanahauan islands* offer good anchorages among them, sheltered from all winds in depths of 15 to 20 fathoms. The best anchorage is in the little port of Aguirre, on the east side of Timpasan island, and near the S.W. point of Kanahauan Dakó. The southern entrance to this port is one cable wide, and from 7 to 12 fathoms deep: the northern entrance is only 2 fathoms deep. The port itself is about 2 cables wide, with a depth of 7 to 10 fathoms in the middle, and 2 to 3 fathoms near the shore.

The passages between the islands and banks that compose the group are safe and deep, and afford easy access to these anchorages, which is a fact, all the more important in that the neighbouring coasts have no harbours. The summit of Kanahauan Dakó is 446 feet high, and that of Timpasan 489 feet; the other islands rise to about 245 feet. They are all covered with large trees, which the natives are now clearing away, and replacing by plantations of *Abaca*.

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* *See* Admiralty plan, anchorages in the Philippine islands, No. 970; scale, $m = 3 \cdot 9$ inches.

Buri island, lying 2¾ miles S.W. of Katbalogan, is only separated from the coast of Samar by a channel less than one fathom deep. There is anchorage on the eastern side of the island at 2 or 3 cables from the shore, in 2½ to 5 fathoms, and also on the north side of the island at 3 cables from the shore, with the summit of the island bearing N. 27° W. in 4½ fathoms.

Katbalogan, the capital of the province of Samar stands on the shore of a little bay at the mouth of the river of the same name. It is a town of 7,000 inhabitants, and carries on a fair trade with Manila, chiefly in hemp and coco-nut oil. The bay, which is open to the S.W., has a depth ranging from 5 to 2½ fathoms, and is fronted by the shoals Lutao, Kinituai, and others which lie from 2 miles west to one mile S.W. by S. of the church in the town; these shoals dry at low water, and between them and the main coast there is a passage to the southward 4½ fathoms deep.

The mouth of the river is obstructed by a bar which only allows ingress at high-water to vessels of not more than 6 feet draught.

Anchorage.—The best berth, and nearest to the mole is 4 fathoms, bottom fine sand, with the house of the governor in line with the church. In bad weather vessels can proceed by the passage between the shoals and the shore to a more secure anchorage under the islands Darajuai and Majaba, which lie 1¾ and 3¼ miles to the southward of the town. Steamers call fortnightly at Katbalogan.

Maqueda bay, the great indentation south of Katbalogan, is little known, it is shallow and only practicable for coasters. Majaba island at the mouth offers sheltered anchorage on its eastern side in 6 fathoms. A shoal awash named Kambalat lies between Majaba and Buat islands; there are 10 fathoms in the channel on either side.

Daram **~~Parasan and~~ Buat islands.**—Dara ~~Parasan~~ is 10 miles long, north and south, low, and bordered by sand-beaches; the western shore is clean, and the rocky islets off it are all high except the one to the northward which only partly uncovers at low water. Buat is circular, about 4½ miles across, rising to a peak 1,155 feet high. There is a sheltered port on the southern side, with a depth of 4 fathoms. The channel (called Buat channel) between these islands and the coast of Samar, is very narrow, and is only used by small coasters going from Bilaran island to Katbalogan.

SAN JUANICO STRAIT, which separates the islands of Samar and Leite is difficult to navigate on account of the currents that run through it, and of the confined width which in some places barely amounts to 2 cables. A number of little islets and banks still further reduce the width of the channel, the depth in which varies from 2½ to 10 fathoms.

Kananai

LIGHT.—A fixed *red* light is shown on ~~Kandua~~ islet, on the south side of Janabatas channel. It stands on supports over a grey shed 33 feet above high-water, and 19 feet above the ground; it should be visible in clear weather at a distance of 7 miles, from N. 71½° E. to S. 14½° W. through south.

Janabatas channel, the northern part of the strait, runs from west to east for a distance of 7 miles as far as Santa Rita island; the narrowest part, 6 cables wide, is at the western entrance; the channel widens to 2½ miles, to the eastward of the narrows, and forms a wide bay, in the middle of which lie the islands ~~Janabon~~ and ~~Tanabai~~; the first of these is bordered by a reef which extends to the north-east; the depth in it is irregular, and varies from 2½ fathoms between the above named islands to 5 and 10 fathoms at the entrance of the next reach, which is more especially known as San Juanico strait. The velocity of the tidal streams in this part is about one knot, the flood stream sets to the west, and the ebb to the east.

Daban [illegible]
Nananai

Santa Rita island is high, clean on the south side, but surrounded on the other sides by a reef which extends furthest to the westward. The island may be recognised from Janabatas channel by a fort and houses on it. From Santa Rita island the strait runs south for 11 miles to point ~~Kamili,~~ at the southern entrance north of Takloban, and has an average width of 6 cables, reduced in some places to 2 cables, and carries a varying depth of 5 to 10 fathoms. A multitude of islands, islets, and shoals line the route and confine the channel. The flood stream sets to the north, and the ebb to the south.

The southern entrance lies between the projecting point ~~Kamili~~ in Leite, and the rounded point on the opposite coast of Samar to the northward; it is 6½ cables wide and 7 fathoms deep. A long spit of sand and mud covered with from 5 to 15 feet least water, stretches from Kankabato bay on the south side of point Kamili to a distance of 2½ miles E.N.E. of the point; and an isolated patch of sand covered by 10 feet of water lies midway on the northern edge of the spit.

Takloban, the capital of Leite, a town of 7,000 inhabitants, stands on the south side of point Kamili. It has two ports: port Panaluran on the north side of the point, offering sheltered anchorage in 3 fathoms, and Kankabato on the south side open to the eastward, and having a depth of not more than 2½ fathoms in the deepest part near point Kataisan, about a mile S.E. of Takloban. Steamers from Manila trade fortnightly with Takloban.

SAN PEDRO BAY, included between point Vigua ~~Inapusan~~ in Leite, and point Alabat in Samar is of rectangular form, some 11 miles square, and contains several islets, besides banks and rocks imperfectly known. There is anchorage on the eastern side of the bay.

Vasey river flows into the northern part of the bay ; the water of this river is said to be salt for 8 miles up the stream as far as some limestone rocks 40 feet high, which form a natural arch and picturesque grotto known as the *Cuevas de Sojotan.* The towns Pansiguikan and Basiao are on the shore 5 or 6 miles east of the mouth of the Vasey, and between these two towns stand some high rocks, 92 feet high, water-worn at the base, with rounded, wood-covered, summits looking like gigantic mushrooms. It is said that the natives used formerly to bury their dead in the rocky caverns of these islets. 19?

Shoals.—The island Jinamok lies south of the mouth of the river Vasey ; it is of moderate height, flat-topped, and surrounded by shoal water. ? A bank that uncovers lies 6 cables S.E. of the island, and a patch of 2½ fathoms lies 1½ miles S.S.W. of the northernmost point of the island. ?

Islands in San Pedro bay.—Dio islet lies 2 miles S.W. of point Kataisan, and one mile from the nearest coast : Panabolon lies, 3½ miles east of Dio : Palos shoal lies 2½ miles south of Dio. ? Kamoropudon and Rasos islets lie north of point Alabat in Samar : Marakitdakit shoal is shown on the chart 3½ miles S.E. of point Alabat ; there is no information about this last shoal. S.W.

The east coast of Leite from point Inapusan to the southward is described with the strait of Surigao in Chap. VII.

CHAPTER IX.

EASTERN COAST OF THE PHILIPPINE ISLANDS; NORTH AND EAST COASTS OF LUZON; EAST COASTS OF SAMAR AND MINDANAO.

Variation 1° 0′ East in 1890.

The information given in this Chapter is derived from the Spanish Derrotero of 1879.

NORTH COAST of LUZON.[*]—**Cape Bojeador,** which forms the north-western extreme of Luzon, is a low point with a reef of breakers projecting from it. Thence the coast trends in a north-east direction 6 miles to point Negra, on the east side of which anchorage may be obtained during southerly winds. The deep bay between this point and Dialao point, 9 miles to the north-east, has much foul ground on its eastern shore. There is anchorage at the head of this bay, near the small port of Bangui, which is said to have been long shut up by an earthquake.

Mairaira point, distant about 20 miles north-east of cape Bojeador, has a reef projecting about a mile out. Point Kabikungan, bearing about E. by S. 13 miles from Mairaira point, is a bluff steep point of white cliffs, having a mass of high mountains, called Patapa Mountains, contiguous to it. To the eastward of point Kabikungan there is a round hill of middling height, named point Pata. The whole of the coast from cape Bojeador to this place is steep, without any soundings until near the shore; the land is of moderate height, and in some parts rather low close to the sea, with several rivers; but the country inland is high and mountainous.

A lighthouse will shortly be erected on cape Bojeador.

From Pata point the coast trends south-eastward for 43 miles, and then north-eastward for 27 miles to cape Engaño, the north-east extreme of Luzon, forming an immense bay. Fronting the sea is a considerable space intersected by rivers. On the western side is the Abulug, a chain of mountains parallel to the coast and about 6 miles inland. There is a continuous beach along this coast with regular soundings, generally 5 to 10 fathoms at a mile or two off on the western part, and the same depths at 3 to 6 miles off shore in the bight of the bay, deepening again near the eastern shore.

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[*] *See* Admiralty chart:—Luzon island, northern portion, No. 2454; scale $m = 0{\cdot}1$ of an inch.

At 14 and 15½ miles S.E. by E. from Pata point are the entrances of the San Juan Pamplona and the Abulug, two small rivers, with a low island between them. A sand-bank, the only known danger on the coast, and on which the sea breaks in bad weather, lies about 2 miles N. by E. of the bar of the Abulug, and fronting the point to the westward of the river. It extends E.S.E. and W.S.W. 2 miles, and about a mile outside it there are 35 and 40 fathoms, fine black sand.

The entrance of the Kagayai, Rio Grande de Kagayan, 14 miles south-eastward of the Abulug, has good anchorage in 10 or 11 fathoms about 1½ miles N.N.E. from its mouth. The point on the east side is known by the church and convent of the town of Aparri built upon it; abreast of which, or north from the church, is the best anchorage. The river is about a third of a mile wide at the entrance, with 2 and 2½ fathoms on the bar, deepening to 5 and 6 fathoms, mud, within the bar. The coast to the eastward of the river is flat, with soundings of 20 fathoms, black sand, about 6 miles off shore. Steamers from Manila call fortnightly at Aparri.

Palaui island,* 5 miles in extent and moderately elevated, lies contiguous to the north-western point of the large promontory which forms the north-eastern extremity of Luzon; and the port of San Vincente is formed between Palaui and the coast. The western shore of the island appears bold, but a reef projects from its eastern side to 1½ miles out, the edge of it being about half a mile from, and around the small islet Escuacha.

Cape Engaño, E. ¼ S., 54 miles from Pata point, is the north point of Palaui island. The two Hermanoz islets lie off this cape, and there are some rocks off the N.E. point, a mile to the east of the cape, and, at a distance of half a mile off, lies the islet Gran Laja, a square, steep mass of lava, about half a mile in extent, which may be seen at a distance of about 27 miles.

Port San Vincente,* 30 miles E. by N. ¾ N. of Aparri, is formed by a small island of the same name lying between the north-east end of Luzon, and the adjacent island of Palaui. There is room in this port for three or four ships, sheltered from all winds; but the entrance is narrow and intricate, being formed between shoals on either side which project from the south-east part of Palaui, and from S. Vincente island ; a vessel is therefore obliged to warp in.

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* *See* Plan of port San Vincente; scale, $m = 0{\cdot}6$ of an inch, on Admiralty chart No. 2,454.

Trueno shoal, which lies three-quarters of a mile south of San Vincente island, does not uncover ; the Spanish Derrotero does not state the depth of water on it. The south-east point of Palaui island kept open to the eastward of the south point of San Vincente island will clear Trueno to the south-east. The currents in this locality are rather strong.

There is good anchorage in 5 fathoms opposite the mouth of the port on the south-west, sheltered from all winds but those between W. and S.W. There is also anchorage along the coast between Aparri road and this place, in 15 or 20 fathoms water within 2 miles of the shore ; the soundings are pretty regular, excepting at a depression in the bank about 10 miles to the S.W. of Vincente, where the depths are 70 to 80 fathoms water about 2½ miles off shore, having close to the edge of it 30 fathoms, black sand.

There is no description of the eastern entrance to this port, but the survey shows a channel of 5 fathoms between the reefs off the Luzon shore and Roña islet, in the centre of the narrows. The approach is from the eastward, and it is a mile wide between the reefs round Escucha islet and those bordering the main.

Bank.—One mile to the northward of Escarpada point, and in a direct line between that point and the N.W. point of Gran Laya islet, there is a rocky bank of small extent, covered by 7 to 15 fathoms.

Reported shoal.—According to the statement of M. Drenie, master of the French bark *Douquay Trouin*, a shoal was passed on the 28th of May, 1875, N.E. of Luzon island. When sighted it was awash. It extended in a S.W. and N.E. direction, thence running N.W. for about 100 yards. The vessel passed within a distance of 2 miles, going 6 knots an hour. M. Denier places the shoal in latitude 19° 5′ N. and longitude 124° 43′ E.

Clare or Anson reef.—Information is wanting about this danger, which is shown on the charts as lying 87 miles S. 73° E. of cape Engaño ; in latitude 17° 49′ N., longitude 124° 40′ E.

Directions.—The channel between cape Engaño and Kamiguin island to the N.N.W. is 20 miles wide, and clear of danger. As the currents set strongly to the northward in the S.W. monsoon it will be prudent for vessels proceeding to the eastward from this coast with light winds to keep on the south side of the channel, to prevent their being drifted to the northward near the Guinapak and Didikas rocks, which lie to the north-eastward of Kamiguin.

NORTH-EAST COAST of LUZON.—From San Vincente the coast runs east for 5 miles, bordered by a narrow reef with detached rocks, to Escarpada point, the north-east point of Luzon, which has been usually distinguished, both in charts and sailing directions, as cape Engano. Here the coasts turn abruptly to the south-eastward for 12 miles to Iligan point.

From point Iligan the coast again turns abruptly to the S.S.W., and then curves gradually round to the eastward, to the headland of Moises, which bears S. by E., distant 64 miles from point Iligan, and is formed by the eastern slopes of mount Moises. The coast in this wide bight is high and clean, but offers no shelter.

Three mountains, the respective heights of which are 2,086, 3,451 and 3,995 feet, rise to the southward of cape Engano, at the distances of 11, 16, and 22 miles, and must be fine landmarks in clear weather. Mount Moises, another one of the range of mountains which traverse the north-east part of Luzon parallel to the coast, is 4,085 feet high, and is a good mark for the ports in its vicinity.

Divilakan bay, north of mount Moises, is open to the northward; the shores are fringed by reefs, and there is a depth of 7 to 9 fathoms in the bay. The little port, Dimalansan, south-east of Divilakan bay, penetrates 2 miles to the south, but is only one cable wide, and only 2½ fathoms deep. Port Bikobian, south of Dimalansan, penetrates 2 miles to the north, and is 2½ cables wide and 9 to 11 fathoms deep.*

Paranan bay, E.S.E. of mount Moises, is semicircular in form, has great depth of water in it, and is free of dangers; but it is quite exposed to the north-east wind. A long sand beach borders the bottom of the bay, into which several small rivers flow. The Spanish survey ends here.

EAST COAST of LUZON.—The coast between Paranan bay and Inaguikan point, 250 miles further south, has not been surveyed, and is very differently drawn on the English and Spanish charts. Some of the positions, as for example cape Ildefonso, 80 miles from Paranan bay, is given on the Spanish chart 10 miles S.E. by E. of the position given for it on the English chart.

The general trend of the coast is S.S.W., and it is stated in the Derrotero to be clean and very steep-to, and, with the exception of

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* *See* plans of ports Dimalansan and Bikobian on Admiralty chart, No. 2,454.

Prueba shoal, to present no off-lying dangers. The bays Tumango (Dilasak on the Spanish chart), Kasiguran, Baler, and Dibut (**Dingalan** on the Spanish chart), are little known; they offer bad anchorages, exposed to all the winds and sea of the Pacific ocean.

Prueba shoal, 3 miles from the main coast, nearly west of the northern point of Polillo island, is the only off-lying danger between cape Engano and point Inaguikan.*

Dingala bay is clean, with a depth of 22 fathoms in the middle of it, and 2½ fathoms at 2 cables from the shore. There are rocks close-to off the south point. In the northern part of the bay there is a creek sheltered from northerly winds, with anchorage in 7 fathoms at 6 cables from the shore.

A rounded point projects from the bottom of the bay, with ten islets off it on a reef which extends 2½ miles north and south; this reef has several rocks awash upon it, and a depth of 4 fathoms at the edge.

The river Dumangas, which enters the southern part of the bay, has 5 feet of water on its bar; and Umirei river, one mile farther south, has 6 feet of water on its bar.

LAMON BAY, comprised between points Inaguikan to the N.W. and the land of Mambulao to the S.E., is protected from northerly winds by the islands Polillo and Jomalig. The little island Balesin lies in the middle of the bay, and, farther in, the islands Cabalete and Alabat; these two last-named islands form with the coast a well sheltered port, with good holding ground. The passage on the eastern side of Alabat is free of danger, but that on the western side is shallow and foul. It must be remembered that the coast here is not well known, and the bays along it have not been sounded out.

Polillo island rises in the centre to a mountain of moderate height with wooded slopes. The north coast is clean and steep; the east coast is bordered with islands and dangerous reefs, but the west coast is clean, except before the port of Polillo, where a great reef runs north-west parallel to the coast, leaving a narrow channel some 14 fathoms deep, leading to the port. The town of Polillo numbers 1,600 persons. Soundings show 9 to 18 fathoms water at a distance of half a mile from this shore.

Port Lampon, in the N.W. part of Lamon bay, is a small but well sheltered port, of a depth of 5 to 12 fathoms over a bottom of sand and mud. The shores are covered by dense vegetation, and commanded by the remarkable mountain, by name Binangonan; several rivers flow into the port, and good water may be obtained. This port is celebrated in the history of the Philippines by having been during a part of the 16th century the depôt of the Spanish galleons and the treasures of Manila, as being situated in a freer position for communication with New Spain than might have been any port in the then little known and difficult strait of San Bernardino.

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* *See* Admiralty chart:—Between St. Bernardino and Mindoro Straits, No. 2,577; scale, *m* = 0·1 of an inch.

Mauban anchorage, lies about 20 miles south of port Lampon. Information is lacking about this anchorage, but it must be a place of trade, as steamers call there. An outline sketch of the port was made by the officers of Malaspina's Expedition in 1792.

Alabat harbour.—There is no information about this harbour beyond what is stated above from the Spanish Derrotero, viz., that the islands Alabat and Cabalete form with the main coast a sheltered harbour of good holding ground; and there is an old record of the tides.

Tides.—It is high water, full and change, at Alabat harbour at 10 h.; springs rise 9 feet.

Port Mambulao, between Pinandunguan point and the Dajikan islands, is safe, sheltered from all winds and easy of access. The depth of water diminishes gradually from 11 fathoms at the entrance of the bay to 2 fathoms before the mouth of a river at the head of the port. The number of fishing enclosures within the harbour considerably obstructs the navigation. The town of Mambulao, at the mouth of the river, is of slight importance; its population amounts to 1,400. This town and the neighbouring one of Parakale are famous for red lead ore found in the vicinity.

Tanaos islets are five low flat islets lying 3 miles N.N.W. of Pinundunguan point. Another low flat island named Tabusao, lies west of the same point.

KALAGUAS ISLANDS are a group of eight islands and several small islets, the largest and most central of which is Tinagu; they are mostly bordered by reefs, and are all low, except Makulabo, which can be seen in clear weather at a distance of 24 miles. Anchorage may be found eastward of Makulabo, from the S.W. part of Tinagu to 3 miles N. by E. of Parakale on the main coast. Water can be obtained on the east side of Makulabo.

Matandumaten islet is shown on the chart at 10 miles S.E. Kabalisai, the easternmost of the Kalagua islands; and midway between these two another islet is shown, with a rock off its southern side. Information is wanting about these islets.

Danger.—A great bank is shown on the charts as lying 23 miles N.E. by E. of the Kalaguas, stretching 20 miles W.N.W. and E.S.E., with 3 to 5 fathoms of water over it. No soundings are given in the neighbourhood of this bank, nor between it and the coast; but it is believed that the channel between the bank and the Kalaguas is deep.

COAST.—Parakale is a town of 2,600 inhabitants in a little bay 7 miles S.E. of Pinandunguan point. Parakale point, the westernmost point of the bay, is low, covered by mangroves, and bordered by a reef. From Bakal point, the eastern point of the bay, the coast trends S. 62° E. as far as Indang point (Jindang), and is low and bordered by a beach, off which there is good anchorage.

Indang island (Kinamanokan), off Indang point, is low, flat, and bordered by sand beaches; it is separated from the coast by a channel 5 to 10 feet deep.

Daet river, which enters the sea 6 miles S.S.E. of Indang (Kinamanokan) island, is 11 feet deep at the mouth, and 16 feet deep farther up. When entering the river, the western shore, upon which stands a fort, must be kept aboard, as there is a reef off the eastern point which is low and covered by mangroves. Steamers from Manila call here.

Kanimo and Kanton islands, situated at a short distance south-east of Daet river, are of moderate height. Kanimo, which is the larger of the two, is about 2 miles long, north and south; its shores are mostly surrounded by rocks, but on the N.E. side there is anchorage on sandy bottom. Five small islands, named Rasas, lie to the southward and south-westward of Kanton island. The water in the neighbourhood of these islands is shallow.

Kolasi point, formed by the slope of Kolasi hill, is high; there is a little bay 3 fathoms deep, between the point and a peaked hill S.W. of it. The town of Kolasi, which stands on the northern slope of the hill, contains a population of 8,000 persons, and must be a place of some trade as steamers call there.

SAN MIGUEL BAY.—To the eastward of Kolasi point the coast forms a clean circular bay, some 20 miles in diameter, surrounded by high mountains, and capable of harbouring in safety vessels of great draught. When entering from the eastward care must be taken to avoid the reefs off Siruma island and Pinitan point.

The depth of water in the middle of the bay is 7 to 8 fathoms, lessening gradually towards the sides. The western shore between Kolasi point and Kabusao river, at the bottom of the bay, is very low, and edged by a sandy beach with shallow water off it.

Kabusao river, which discharges itself through a low flat shore, is one cable wide, and 3½ fathoms deep at the mouth; farther up it carries a depth of 2½ fathoms throughout a length of 24 miles as far as the town of Nueva Carceres, of 7,300 inhabitants. A bank of sand, covered by 3 feet water, projects 2 miles* to the N.E. from the mouth. There are two other shoals to the westward of the outer end of the bank. Kabusao is only a fishing village.

Kabalanga river, 6 miles to the eastward of Kabusao, has a good depth of water. The town of the same name, of 6,350 inhabitants, is built a little way up the stream.

Siruma point and island.—From Kabalanga river the coast rises and continues of moderate height as far as Siruma point; the depth of water off this coast is irregular, and some shoals and small islands lie near it. Siruma point is connected with the small island close to it by a reef; another reef extends 1½ miles W.N.W. of the island, and dries in places.

THE COAST.—Siruma bay, to the eastward of the point, has depths of 7 to 9 fathoms, sand. From the northern point of the bay a reef projects 2 miles to the N.W.; the breakers on this reef can be seen to some distance. Between Siruma bay and port Sisiran, the coast is bordered by islands and rocks. The several bays that it forms are foul, and accessible to fishing boats only. Botauanan, the northernmost island on this part of the coast is high and surrounded by rocks.

Kinalasag island, which forms the northern side of port Sisiran, is about 4 miles in length, moderately high, and clean on the side towards the port. Bagakai island, and several smaller islets lie off the northern point, and from the northern part of Bagakai, a reef with rocks awash extends half a mile out. A rock (Laja) on which the sea breaks lies 1½ miles off the N.E. shore of Kinalasag, off the entrance to port Sisiran. Of the two passages on either side of this rock, that to the westward is the best; soundings show depths of 14 to 23 fathoms at less than a mile from Kinalasag.

Sisiran port is clean and capacious, and has good anchorage sheltered by high ground. The entrance, open to the north, is

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* The chart shows it to project to 4 miles.

1½ miles wide and has a depth of 10 to 12 fathoms near the point of Kinalasag, and 7 fathoms near the edge of the reef which surrounds the eastern entrance point to a distance of 2 cables. Within the port the depth of water decreases gradually from 10 fathoms at the mouth to 2¾ farther in, bottom, sand and mud, near the shore. Water can be obtained on the eastern shore, but no provisions are procurable.

Tagun bay, east of port Sisiran, has not been explored.

Lahui island is 4 miles long N.N.E. and S.S.W. Its north-western extremity terminates in a remarkable sharp peak like a sugar loaf, higher than several islets which lie near it. The north-eastern point is bordered by a reef to the distance of 3 cables. At a distance of 3 miles N.W. of the Sugar Loaf, there is a group of four islets, the largest of which is 3 cables in length, with a reef projecting one mile to the northward from it, and surrounding two still smaller islets. The southern islet of the group lies 7 cables S.E. of the largest islet, and is clean and steep-to. The channel between these islets and Lahui island is safe, and has a depth of 12 to 27 fathoms.

Coast mark.—The Sugar Loaf above mentioned makes a good mark for the entrance of port Sisaran when coming from the eastward.

Kanamuan port, situated at the foot of the highest mountain of this part of the coast, is very small, and has a depth of only 2½ to 3½ fathoms. The town Kanamuan is 4 miles inland, on the left bank of a river. Kanamuan point, 4 miles east of the port, is high and steep, as is also the coast which runs S.E. by S. for 5 miles from it, as far as point Bungus.

Katanaguan islands, 2 miles east of Kanamuan point, are small, low, and surrounded by reefs. Taebun channel, between the above-named islands and point is clear, with 17 to 8 fathoms of water. The two islets Palombon, east of point Bungus, are separated from that point by a channel 1½ miles wide and 15 fathoms deep.

KATANDUANES ISLAND, separated from Luzon by Maqueda channel, is about 38 miles long north and south, and 22 miles broad, and traversed throughout its length by a chain of mountains It is abundantly supplied with small rivers, from the sands of which the natives obtain gold dust. The soil is fertile and produces rice, maize, sesame indigo, cotton, and abaca (manila hemp) ; and there are good pastures for rearing horses and oxen.*

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* Crawfurd, dictionary of the Indian islands.

The population in 1879 amounted to 21,000 persons. The west coast is, in general, safe and steep; the east coast, bordered by little islets, presents some bays with bad anchorage; and off the north coast there are various islets and shoals detached from the shore to a distance of 10 miles.

Iot point, the northern extremity of the island, is of moderate height and steep-to. Matulin island, 3 miles E.N.E. of Iot point, is the centre of a circular reef about 2 miles in diameter and awash throughout its entire extent.

Horadaba islets, are three rocks, the northernmost of which bears N. 31° W. distant 3 miles from Iot point. Abriop bank, one mile N.W. of Horadaba islets, has not been surveyed; it is shown on the chart as extending 3 miles from east to west, and one mile from north to south.

The Palumbanes islands are a little group of three islets 4 miles west of Karao bay. A shoal upon which breakers were seen, is reported to be situated about 4 miles northward of Palumbanes islands. A rocky bank, one cable in extent, lies in the channel between the Palumbanes islands and Karao bay.

Karao bay, on the N.W. part of Katanduanes island offers fair anchorage over a rocky bottom; there is no other anchorage on the west coast of the island.

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Sialat point, on the S.W. part of Katanduanes is high. Agajo point, 5 miles south of Sialat, is low and covered by mangroves; from this point the coast trends S.E. by E. for 7 miles to Tuguntun point, and is high with little bays in it, which do not afford anchorage. The town of Kalolbong of 1,600 inhabitants, lies midway between the two points; the chart shows two shoals off Kalolbong.

Kabugao bay, on the south side of the island, is 11 miles wide between the points Tuguntun and Nagumbuayan, and 18 fathoms deep, shoaling gradually to 4 fathoms near the shore. Tuguntun point, the southern point of the island, is low and bordered by rocks, and 2 miles N.E. of the point there are two rocky shoals. Farther north, on the left bank of a little river, stands the town of Birak, the most important on the island, with 4,100 inhabitants. Kabugao river, on the eastern side of the bay, is fronted by two islets, and has a bar which nearly dries at low water. The towns of Kabugao and Bato, each of 2,000 inhabitants stand on the banks of the river. The western shore of Kabugao bay is bordered by banks and rocks.

East coast of Katanduanes.—Port Baras has a depth of

3 to 7 fathoms, but is obstructed by reefs which make the entrance difficult. Port Bagamanok on the N.E. coast offers two anchorages. The southern anchorage is between the island Panai and Anajao point; the entrance which runs east and west, leads into a little semicircular bay, between two islets, having a depth of 4½ to 7 fathoms. The northern anchorage is situated at the southern extremity of the narrow channel between the reef off Minigil point and off Panai island, and, it has a depth of 17 fathoms, lessening to 7 fathoms, sand, opposite the town of Bagamanok.

Winds on the east coast of Luzon.—From cape Engaño to the bay of San Miguel, N.E. winds prevail from October to March, the monsoon here beginning with north winds which are of short duration and soon pass into the north-east; and January and February the east winds begin, and terminate the monsoon. The heaviest rains fall from October to January, and in October typhoons sometimes occur. In March and April, and sometimes in the beginning of May, variable winds blow, bringing in the south-west monsoon; but the dry season, of which April and May are the driest months, is uninterrupted by rain.

Thunder storms occur from June to November, most frequently in August. During the south-west monsoon the sea is very calm, but in the middle of the north-east monsoon all navigation ceases on the east coast.

Tides.—The flood stream sets to the northward, both on the the east and on the west side of Katanduanes island, and to the westward along the part of the coast between Katanduanes and Polillo island. There is no information as to the hours of high-water.

COAST of LUZON.—Lagonoi gulf has not been sounded, nor are its coasts well known; it appears, however, to be safe, and no dangers have been reported on the route between Maqueda channel and Tobako bay in the southern part of the gulf. The part of the coast that runs N.W. of Tobako for 8 miles as far as Tibi town, is bordered by a sand beach with good depth of water off it.

Mount Isaro, which rises to a height of 6,462 feet between San Miguel bay and Lagonoi gulf, is an extinct volcano of 36 miles in circumference. Its eastern slopes reach nearly to the waters of Lagonoi gulf, while its western slopes are separated from San Miguel bay by a wide strip of alluvial soil. Mount Iriga, between mount Isaro and Albai Volcano is 3,976 feet high.

Tobako bay, in the southern part of Lagonoi gulf, is fronted by the islands San Miguel and Kakrarai, and is by them formed into an excellent and capacious harbour 6 miles long and 3½ miles wide, with a depth near the shore of 9 to 5½ fathoms. These two islands are connected by a reef, and Kakrarai is only separated from Sula point, the southern point of the bay, by a narrow, winding, and impracticable channel. The entrance to the harbour, between points Natunaguan on the main coast of Luzon, and Guinambam on San Miguel island, is 7½ cables wide. The first of these two points is clean; but a reef projects to the N.W. from point Guinamban, to a distance of one mile, and continues round the north coast of San Miguel.

The town of Tobako, in the north-west part of the bay, contains a population of 13,600 persons, and carries on a brisk trade with Manila, steamers calling there three or four times a month. From Tobako the coast is steep with 4½ fathoms close to it, as far as Bagakai, a town of 9,200 persons, situated 4½ miles S.S.E. of Tobako. Anchorage may be had anywhere between these two places, but the best is off Tobako, in front of the church.

From Bagakai a reef stretches across the southern part of the harbour to Kakrarai island, inclosing the islet Bugias, which is round and flat topped, and closes the mouth of the Sula channel. Pilis bay is a lagoon some 7 fathoms deep, into which vessels of very light draught can enter at high water.

Tides.—The flood stream sets to the north, and the ebb to the south.

The islands San Miguel, Kakrarai, and Batan.—These islands are separated from each other by channels full of rocks and shoals that dry at low water, rendering them impracticable; the north coast of San Miguel is bordered by reefs, the extent of which has not been determined; it is, therefore, prudent to give the coast a berth of 2 miles at least.

Rapurapu island is high; it is separated from Batan by a channel 2 miles wide, but too much obstructed by rocks to be navigable; a reef stretches about a mile out from the middle of the south shore, and dries at low water; and a rock lies one mile W.S.W. of the western point of the island.

ALBAI GULF, south of the above-named islands and 22 miles long east and west, is 4 miles wide between Rapurapu island and Montugan point in Bulusan, and of the same width between Kakrarai island and Paron point The shores are in general steep, but the opening in the southern part, called Poliki bay, is shallow and foul. The Spanish Derrotero states that there are only two shoals in the inner part of the gulf, 2 miles from the shore at the head, but the Spanish chart of 1873 shows "*Varios bajos*" (several shoals) in the middle of the inner part.

Sula port, formed by the southern part of the narrow channel that separates Kakrarai island from the main land, is well sheltered and has good holding ground. It is 4 cables wide, and 11 fathoms deep at the mouth, continuing the same width and depth for half a mile to the northward. The channel then curves to the westward and narrows to half a cable, so that only the lightest of coasters can enter Tobako bay by it. Both of the entrance points are bordered by reefs one cable wide.

Livok, at the head of Albai gulf, is a town of 3,600 inhabitants, on the left bank of a little river. A reef lines the shore near the town, and is shown on the chart to extend to three-quarters of a mile from the shore.

Shoals.—S.E. of Livok, at a distance of 2 miles there are two rocky shoals, one cable in extent and covered by 3 feet of water. From the northern shoal Sula point bears N. 56° E., and Livok town N. 30° W. From the southern Sula point bears N. 56° E., and Livok town N. 22° W. This locality should be approached with caution.

Albai river, about 6 miles south of Livok, is of no great importance, and has only one foot of water on the bar at low-water. The new town of Albai, capital of the province, of 10,460 inhabitants, stands on level ground one mile W.S.W. of the old town of Albai, which was the capital before the eruption of the volcano in 1814. The new town is sheltered from the volcano by an isolated hill named Linguin, which, as also a low hill named Kapuntakan on the south point of the river, are good marks for making the anchorage. Between Livok and the river Albai the shore is bordered by a sand beach, having depths of 9 to 11 fathoms near it. The town of Albai exports hemp to the value of $3,000 annually.

Albai volcano, situated on a great plain about 5 miles from the shore near Livok, is one of the most remarkable volcanoes of the Archipelago ; it forms a perfect cone 8,274 feet high, always crowned by a great plume of vapour, and is a good mark for navigating the coast.

COAST.—Poliki bay is obstructed by reefs, at the edge of which there are soundings of 5½ fathoms ; on the western side there are several little channels which do not afford good anchorage.

Paron point, the N.E. point of the gulf, is high and steep : there is a thermal spring near it, the vapours from which can be seen at a great distance.

Jesus point, 2 miles S.E. of Paron point, has on its western side a little beach, near which there is anchorage. From point Gajo, 2 miles S.E. of point Jesus, a reef, which extends westward nearly a mile, fringes the shore as far as the head of Sugot bay.

Sugot bay is 1½ miles wide, and penetrates 2 miles to the southward ; the eastern shore only is accessible and is bordered by a sand-beach with a depth of water of 5½ fathoms near it ; the western shore is fringed by a reef. The river and town of Sugot are at the head of the bay : vessels drawing 19 feet can approach the mole of the town.

Coal.—A layer of coal, similar in quality to Australian coal, has been discovered at Gatbo, a village S.E. of Sugot town.

Montugan point.—A line of reef extending more than a mile out fringes the shore from point Pagjuriran to point Montugan, and continues round the coast into San Bernardino strait.

SAN BERNARDINO STRAIT has been described in Chapter VIII.

Ships steering for this strait generally make the bold high land of cape Espiritu Santo, the N.E. extremity of Samar, which is proper with an easterly or southerly wind ; but if the wind be northerly it seems advisable to steer direct for the strait, as the north coast of Samar becomes, with that wind, a lee shore for 60 miles nearly West; from this cape (Espiritu Santo) to the entrance of the strait the shore is bordered all along with islets, shoals, and reefs.

The EAST COAST of SAMAR has not been sufficiently explored to afford an exact description. It is, however, known that the coast is irregular and hilly, bordered by little islets and rocks, and fringed by a narrow reef which is clean and steep-to : that there is no good port on the coast, and that the several bays which open along it offer neither good anchorage nor shelter from the winds and seas of the Pacific ocean.

Cape Espiritu Santo, the north-eastern extremity of Samar, lies 11 miles E.S.E. of Palapa port, and is formed of high land scarped and steep, visible in clear weather at a distance of 40 miles, serving as an excellent mark for working the strait of San Bernardino.

The mountain *Mesa de Palapa*, which rises 10 miles south-west of cape Espiritu Santo, is always visible to a distance of 42 miles.*

Borongan, in latitude 11″ 41′ N., is the only place on the coast where supplies can be obtained. The town which numbers 9,400 inhabitants, stands at the bottom of a little bay about a mile wide and 6 cables deep with a sandy beach at the head of it. The river Burumhan discharges itself into this bay, the entrance to which is between the islands Ando and Divinubo, both moderately high. The depth of water is 37 fathoms between these islands, 26 between them and the bay, and 5½ fathoms very close to the shore of the bay. Ando island is united by a reef to Anitaguipan point on the main coast to the northward; and there are islets and reefs between Divinubo island and the point of the coast south of Borongan. A small steep rocky shoal lies in the middle of the bay, with the south point of Ando island bearing N. 70° E.

Anchorage.—During the N.E. monsoon the best anchorage is about 4 cables south-west of the middle of Ando island; during the S.W. monsoon there is good anchorage in the bay of Borongan, and also in another bay immediately to the south, in 9 fathoms at 6 cables from the shore.

The Suribao or Saru river enters the sea about 2½ miles south of Borongan, with a wide estuary closed by a narrow bar. This river takes its rise to the south-west, not far from the sources of the Vasey river which flows into San Pedro bay.

The coast.—From Borongan to the southward the coast is less elevated than it is to the northward. There are extensive coco-nut plantations between Borongan and Lanang, chiefly utilized for the production of coconut oil. An extensive, but little known, bay opens between the north part of the peninsula of Guiuan and Nagos point. In the entrance of this bay and to the northward of it there are several islets united together by a reef. The peninsula of Guiuan is fringed by a reef which extends at furthest to one mile from the shore. Near the edge of the reef several sulphur springs gush forth which are covered at high-water, but are nevertheless not brackish.†

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* **Shoal.**—The "Derrotero" of 1879 mentions the following remark from an unpublished M S. of Captain D. Antonio Percy Gill: "Between cape Espiritu Santo and the islet of Gibata, there is an islet near the coast, and 6 miles N.E. of this islet there is a great steep rock with shallow water round it." Neither the island Gibata, nor the shoal, however, are marked on either the Spanish or English charts.

† The Spanish "Derrotero" does not say at what part of the coast these springs occur.

SOUTH COAST of SAMAR* is formed by a tongue of land of moderate height, terminated by a little island. The town of Guiuan, of 13,900 inhabitants, stands on the western shore 10½ miles from the south point. The land between this point and the town is higher than the rest, and is fronted by a wide reef extending 7 miles to the west of the point, and 6 miles south-west of the town.

Between the town of Guiuan and point Gigoso, which lies 13 miles W.N.W. and has a little hill on it, there is a bay of irregular outline and full of dangers; the shores are completely hidden by mangroves and fronted by a reef, an opening in which, however, leads to anchorage in 3¾ to 6 fathoms opposite the town of Guiuan.

Manikani island, 4½ miles south-west of Guiuan, is nearly circular, 2½ miles in diameter, with a central hill of moderate height. It is surrounded by a reef which reaches 5 miles to the north-west, with a width of 2½ miles, and having on its end the islets Baul and Binabasalan. Between the island and reef of Manikani and the main coast reef, there is a deep channel running 8 miles S.E. and N.W. This channel is 2 miles wide and 11 to 20 fathoms deep, with several little islets in it. Vessels of all sizes can find anchorage in this channel under the shelter of the islets.

The southern entrance to this channel, between the S.E. point of Manikani and the western edge of the reef off the south point of Samar, is 1⅓ miles wide and 15 fathoms deep in the middle. At 7 cables N.E. of Manikani there is a rock which dries at low-water, and which can be passed on either side, but the best course to follow is to leave this dry rock and the islets Kambasingan and Kabalarian to the west, and Kaninoan islet to the northward.

The northern entrance, between the islet Balinalto, on the shore of the bay (with a *vantay* on its southern end), and the islets Baul and Binabasalan on the end of the Manikani reef, is three-quarters of a mile wide and 17 to 20 fathoms deep.

Anchorage may be found in the opening of the reef leading to the town of Guiuan, with the church bearing N.E., care being taken to avoid the edges of the reef on both sides, as well as a small shoal patch in mid-channel, and a large shoal near the anchorage. The depth of water at the entrance of this opening is 14 fathoms, lessening gradually to 6 and 3¾ fathoms off a sand beach bordered with rocks in front of the town. There is also anchorage N.E. of the islet Kabalarian in 13 fathoms.

The coast.—From Gigoso point the coast trends westward for

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* *See* Admiralty chart, No. 962, S. part of Samar; scale, $m = 0{\cdot}7$ of an inch.

16 miles as far as Capines point, and forms between these points two clean bays with deep water in them, separated by Kablagna point. The villages along this coast offer few resources, and neither wood nor water can be procured.

Shoals.—A rocky shoal is marked on the chart one mile south of / ½ Kablagna point. In 1861 H.M.S. *Sphinx* struck on a coral reef having one fathom water on it, lying half a mile from a low point south of Maglobo. From it Capines point bore N. 87° W., and the west side of Jumantral (Malhon island) S. 40° E. It is 800 yards in length N.W. and S.E., and about 250 yards east and west, and is probably identical with the shoal laid down in the chart about half a mile S.E. of this position or one mile S. of Kablagna point. The chart of this part of the coast is not very correct.* Another rocky shoal named Kalianan lies in the entrance of the bay between points Kablagna and Capines.

Capines point is moderately high and wooded. Alabat point, at the entrance of San Pedro bay, lies 2 miles W.N.W. of Capines.

The east coast of Leite island and Surigao strait, with the N.E. coast of Mindanao to Kauit point, are described in Chapter VII.

EAST COAST OF MINDANAO runs nearly north and south for a length of 195 miles from Kauit point to cape San Augustin, and forms several bays open to the N.E. A great chain of mountains runs parallel to the coast and near to it. The coast is imperfectly known, and too great reliance must not be placed on the charts.†

Kauit point is a spur of the eastern cordillera of Mindanao; when seen from the northward it appears bluff, but viewed from the south-eastward it makes like two islands. It is clean and steep to the northward and westward, but a reef projects from it to the eastward for 1½ miles, and borders the coast to the southward for a distance of 10 miles.

Tanda point, shown on the chart as lying 14 miles S. ½ W. from Kauit point, is bordered by a reef to a distance of 2 cables. Two islets lie close to the northward of the point. Makangani island, 4 miles N.W. by N. of Tanda point, is clean; two rocky islets lie off its northern end.

Arangasa island.—From Tanda island the coast trends S.E. by S. for 19 miles as far as Umanum point. North of this point is the island Arangasa, separated from the main coast by a narrow channel closed by reefs, which extend 3 miles out, east and south-east of the island.

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* N. O. Remarks, H.M.S. *Sphinx*, 1861.

† *See* Admiralty chart, Sulu or Mindoro Sea, Eastern part, No. 2,578; scale, $m = 0{\cdot}1$ of an inch.

Liangan bay, between points Umanum and Bankulin, is foul, especially along the northern shore, from which a reef runs 2 miles out, enclosing the islet Ayninam. Liangan town is at the bottom of the bay ; the chart shows a shoal in the fairway leading to the town, but gives no soundings whatever.

Mr. Lloney, Lloyd's agent at Iloilo in 1878, says of Liangan bay : "The best anchorage is off the convent in 15 fathoms of water. A heavy anchor should be used, as the land winds are strong. The river marked on the chart as flowing at the head of Liangan bay, is only a shallow creek. The coast here is rocky, and landing after dark is difficult. Supplies of fresh water, buffaloes, and rice, can be had, but no vegetables."

The coast, which trends south for 15 miles from Bankulin point to Bislig bay, is very foul, and bordered by dangerous sand banks, which uncover at low-water. The town of Kinatuan is situated on the right bank of a river about 12 miles south of Bankulin point, fronted by Tigdos islet, which is surrounded by a reef. Supplies of buffaloes and rice can be obtained at Kinatuan, but very little fresh water.*

Bislig bay and town.—Masahuron island, in the middle of the entrance to the bay, is surrounded by shoals which extend half a mile east and west of the island. In the passage south of the islet there are two rocky shoals very steep-to, having depths of 47 and 65 fathoms very near them. The southern shore of Bislig bay is clean ; the northern shore, on the contrary, is foul, and should not be approached within 6 cables length.

Bislig town, a military residence, with a population of 4,300, is at the bottom of the bay on the right bank of a river ; the bar at the mouth of this river has two feet of water over it at low water, and 8 feet at high water.

The anchorage is, before the town, in 3½ fathoms, bottom sand and mud ; and is completely sheltered from all winds. Fresh water, buffaloes, and rice can be obtained at Bislig, but no vegetables.*

Caution.—If without a pilot in approaching the coast of Bislig bay, do not come into less than 6 fathoms, as the water shoals rapidly. The channel for boats and lorchas is generally marked by bushes or stakes.*

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* R. Loney, Esq., Lloyd's Agent at Iloilo in 1878.

The coast.—A reef extends 3 miles out to the east and 6 miles to the S.E. from Sanko point, the southern point of Bislig bay. The coast, from this point for 6 miles to the southward as far as Tambog point, is bordered by reefs. South of Tambog point, between that point and Katarman point, there is a great reef which forms with the main coast a small but safe port; the narrow channel leading to it should not be taken without a pilot.

South of Katarman point there is a great bank which dries; at the edge of this bank there is a depth of 3¾ fathoms, and to the south of it there are two islets surrounded by rocks. A shoal of sand projects half a mile N.W. of point Tonkil. From the Katel river, south of Tonkil point, the coast trends south for 13 miles as far as Kinablagan point, and is clean.

Kinablagan point is high and wooded; when seen at a distance it appears like an island. The river and town of the same name lie on the south side of the point. There is anchorage off Kinablagan near the shore in 8 fathoms, but it scarcely merits the name of anchorage, as it is quite open and exposed. The river can be entered by boats only.

Baganga bay, between points Lambajon and Daguet, offers good anchorage during the S.W. monsoon, in 5 fathoms, a reef which projects from Daguet point giving shelter from the east and south-east; but during the N.E. monsoon the anchorage is quite untenable on account of the heavy sea which sets in. Daguet point is detached from the coast, and consists of white sand covered by low wood. A shoal of 4½ fathoms water lies off it.

From Daguet point the coast trends south for 15 miles as far as Karaga bay, and presents low points and some small rivers. A few villages of slight importance stand on the shore.

Karaga bay,† between points Sankol and Pusan, is semi-circular in form, open to the eastward, and penetrates about 2 miles inland. The village of Sankol stands on the shore near the point, and near a coco-nut plantation. There is anchorage in 4½ fathoms W.N.W. of point Pusan, off some rocks at the commencement of a beach, but it is exposed to the swell; there is also anchorage off Tubu on the south side, sheltered from southerly winds; it is the only place on the south coast where there is a sand beach. Sankol point is low; a rocky shoal covered by 1½ fathoms water projects a mile out from it.

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* R. Loney, Esq., Lloyd's Agent at Iloilo in 1878.

† *See* Admiralty chart:—Celebes sea, eastern part, No. 2,575; scale, $m = 0{\cdot}1$ of an inch.

Pusan point is low, and formed of cavernous rocks; it is clean, and may be rounded at a cable's distance. The current begins to be strongly felt off this point, and at spring tides violent eddies are produced, raising a high sea.

Bunga point, 9 miles south of Pusan point, is the first point which is not mountainous met on coming northward from cape San Augustin. There is a bay south of the point, on the shore of which stands the village of Manai, with a little fort surrounded by *cogonals* of a red colour.

Buan point, 6 miles south of Bunga point, is sandy, with a narrow reef off it, and may be recognised by a *cogonal* on it. A little river, which can be entered by boats only, passes through the cogonal. Fresh water can be obtained from it.

Maglubun point, 4 miles S. by W. of the last point, is clean and projecting, and easy to recognise. Several villages stand on this part of the coast, which is clean and wooded, but beaten by the sea. The village and fort of Mamponon are near a small river, but there is too much sea on the coast for anchorage.

Mayo bay, between Tugubun point, 8 miles south of Maglubun and Lamigan, is a large bay, over 5 miles wide at the entrance between these two points, and penetrating 7 miles to the westward; it is but little known. Tugubun point is hilly and wooded; a shoal of sand-rock projects one cable from it. Yukatan anchorage is on the north shore, 2 miles west of Tugubun point. Points Flaca and Gorda, west again of Yukatan, are formed by hills which terminate in low points; a reef extends 2 miles out from Gorda point.

PUJADA BAY, separated from Mayo bay by the long peninsula of Guanguan, which terminates in Lamigan point, would be the best in Mindanao were it not for the very great depth of water in it. It penetrates some 10 miles from the entrance, and has an extreme width of 5 or 6 miles about the middle of it. Pujada island, 200 feet high, divides the entrance into two channels; of these, the southern, although the narrowest, is the safest on account of the reefs on both sides of the northern channel; the reef of Pujada island extends 2 miles eastward, and ends in a flat-topped islet or rock; the sea breaks on this reef even at high water,

Lamigan point, the northern point of the bay, is said to be clean to seaward, but fringed on the side of the bay by a wide reef as far as Batiano point, and should not be approached within half a mile. Velasco shoal, awash at low water, is reported to lie S.E. by E. of Piedra, with a depth of 18 fathoms between it and the point; neither Velasco shoal nor points Batiano and Piedra are given on the chart. The shore continues foul as far as the town of Mati; a small creek, 3 miles E.S.E. of Mati, leads to an isthmus 40 yards wide, separating the bays of Pujada and Mayo. The natives haul their canoes across this neck of land and launch them in Mayo bay.

Mati is a small town, standing in a wide prairie land, surrounded by picturesque scenery; the shore near it is steep-to, and there is a depth of 11 to 13 fathoms close in. Good water is obtainable but provisions are scarce. The coast at the head of Pujada bay makes several indentations, the principal of which is called Balete port. Kamainsi point, in this locality, is foul.

Makambol point, on the south side of Pujada bay, ends in a reef, to the westward of which there is anchorage in 8 fathoms near the shore. A shoal of 2¾ fathoms water lies off the point. There are plantations of coco-nut and plantains on this part of the coast. Off Magun (not marked on the chart), east of Makambol, there is indifferent anchorage exposed to the sea.

Tumadgo point, the southern point of Pujada bay, and also Alo point, a little to the southward, are peaked and clean.

Tides.—In Pujada bay it is high-water, full and change, at 7h. Springs rise 6 feet.

Steamers from Samboanga and Palak trade to Mati. The shores of the bay abound in good timber, such as *Alintato*, an ebony; *Molavi*, a teak; *Camunu*, connarus santaloides, useful as a cabinet-makers' wood; and cedar. Cacao, coffee, and tapioca are cultivated; mastic of good quality, wax and honey are plentiful; deer and mountain hog abound.

COAST.—Luban point, off which there is a small round islet, is clean and bold; in a small bay to the northward of the point, vessels can find shelter in 5½ fathoms during the S.W. monsoon, while waiting for favourable weather to round cape San Augustin. The coast between point Luban and Pujada bay is clean, and presents several scarped points with patches of red *cogonal* on them. The coast between point Luban and cape San Augustin is high and clean, with little points of sand and rock.

CURRENTS on the EAST COAST of MINDANAO.—A constant current to the south has been observed on this coast, especially at a distance beyond 4 miles from the shore ; within this distance the tides preserve their influence in some places, but near the projecting points the current remains constant. To the northward of Mayo bay, this current shows itself in strong races which increase on approaching Pusan point, where they attain their greatest force. They are very violent off Daguet point, and also off points Lambajon and Kinablagan. In order to lessen the effect of the current, a vessel should keep at a good distance from shore. Near the coast the sea is always very rough and choppy, and vessels suffer a good deal from it.

CHAPTER X.

CELEBES SEA, BASILAN STRAIT TO MOLUCCA PASSAGE.

Variation in 1890 1° 35′ easterly.

SOUTH COAST of MINDANAO.*—**Sibuguei bay.**—From the N.E. entrance of the Sakol channel the coast of Mindanao trends N.N.E. for 53 miles, and then, curving round to the southward for 30 miles, forms the extensive bay of Sibuguei, terminated to the S.E. by Oluntanga island. The coasts of this bay are bordered by islands and reefs, and have not yet been properly surveyed; navigation in it should therefore be conducted with caution.

Panubigan islands consist of fifteen small islands, and several little islets situated near the coast of Mindanao. They are wooded, and, for the most part, clean and steep-to. The northernmost of the group, Palma brava, is surrounded by a reef which projects a quarter of a mile to the N.E., and almost joins the coast. Between this island and the reef off point Koroan, there is a small anchorage of 7 fathoms depth. There is also anchorage in 5 fathoms in the two little bays south of Panubigan islands.

Coast.—From the Panubigan islands the coast runs N.N.E. for about 14 miles to point Vitali, which is fronted by four islets, clean and steep-to, and several rocks which extend out for 3 miles from the point; they are named Tigbaon islands.

Port Banga, situated 6 miles to the northward of the Tigbaon islands, is safe and well sheltered; it is 2½ miles long N.E. and S.W., with a maximum width of one mile. An islet, with a reef extending 3 cables to the south, divides the entrance into two deep passages 1½ cables wide. In the eastern channel the depth is 13 fathoms, lessening gradually to 1½ fathoms inside the port; the sides are steep-to. The best anchorage is in 9 fathoms, half-way between the eastern point of entrance and an island to the north. The reef off the east point of entrance extends 1¼ miles to the eastward, and 2¼ cables to the S.W.

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* *See* Admiralty charts, Sulu or Mindoro Sea, Eastern Part, No. 2578; cale $m = 0{\cdot}1$ of an inch; and Sulu Archipelago, No. 2576; scale $m = 0{\cdot}1$ of an inch.

The **coast** then trends N.N.E. ½ E. for 21 miles, forming several bays edged by islets and reefs, with soundings of 14 and 36 fathoms at 2 miles from the shore, as far as 2 miles north of Buluan island, which is small and surrounded by rocks. From this position there is a line of soundings of from 12 to 23 fathoms across the head of the bay to Kabut island; northward of this line there are said to be shoal banks.

The village of Marasingan, near which layers of coal have been found, lies 4 miles inland to the S.E. of Kabut island.

The east coast of Sibuguei bay, from Kabut island to the narrow channel separating Oluntanga from the main land, is bordered by a reef of small extent with detached shoals, steep-to, off it.

Pandalusan island, 5 miles off the coast, is of moderate height and surrounded by a narrow sand-beach, steep-to. A rocky shoal of one mile extent lies 4½ miles N. by E. of Pandalusan, and at 4 miles E.N.E. of this shoal there are two more smaller shoals, near the coast. Between Pandalusan and the first shoal, and between these and the other two shoals there are soundings of 11 fathoms.

Danger line.—The chart indicates by a line of points the edge of a dangerous reef starting from the two shoals above-mentioned, and surrounding Olutanga. To avoid this reef, the island Pandalusan should not be brought to bear to the westward of N. ½ E., until 7 miles to the north of that island, when an east course may be steered, passing to the north of the shoals, which form the limit of the reef.

Circe bank, discovered by the French sloop of war *Circe* in 1864, was reported to consist of sand and coral, of half a cable's length, with 4 fathoms water over it, 6½ fathoms around it, and 27 fathoms at one cable's distance; Pandalusan island bearing from it N. 17° E., and the south point of Olutanga island S. 86° E. In the Spanish Derrotero it is stated to be one mile in length, N.N.W. and S.S.E., to have only 1¾ fathoms water over it, and to be situated with Pandalusan island bearing N. 1° E., the easternmost islet of the Tigbaon group N. 67° W. and the south point of Olutanga island S. 82° E., distant 9½ miles.*

OLUTANGA ISLAND is very low, covered by mangroves, and surrounded by reefs. The channel separating it from the main land is only practicable for boats.

Tantanang bay.—The entrance to this bay is open to the south-east, and is 2 miles wide between the reefs that project from the coast of Olutanga, and from the north point of entrance; and there is 6 to 8 fathoms depth between the islands Letayen and Sibulan. In the middle of the mouth there are two shoals of 3½ and 2¾ fathoms. In the centre of the bay there are some shoals of white sand awash at low water; between them and the western shore the bay is well sheltered, and has a depth of 13 fathoms, lessening gradually to the northward; a river enters on the western side.

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* Mercantile Marine Magazine, Vol. XII., p. 29. Spanish Derrotero, 1879, p. 762.

Tumalung bay, on the north side of Olutanga, has a good depth of water, and is well sheltered in all weathers. There is anchorage in 9 fathoms west of point Simangul, the northern extremity of Olutanga; an islet, fringed on the northward by a reef of 4 cables extent, lies near this point, and a little to the N.N.E. of the point there is a bank of sand.

DUMANKILAS BAY affords good shelter and holding ground among the islands and bays that it encloses; the general depth is 8 to 16 fathoms, with five fathoms near the shore. The coast of Lapirauan is foul, but on the edge of the reef that borders it there are 8 fathoms; anchorage can only be had at a long distance from this coast.

Acha rock, a small circular patch of sand and coral, steep-to, and covered by 2¾ fathoms, least water, lies in the entrance of the bay, 6½ miles west of point Dumankilas.

The islands Muda, Dakula, and **Paya,** are clean and steep-to, with channels of 9 fathoms depth between them. To the west of Paya there is a rock. Piratas rock lies one mile east of Dakula island; it is steep-to and uncovers at very low tides.

Cherif islands are three small islands, clean and steep-to, dividing the channel into two passages.

Dayana island is also clean; to the W.N.W. of it lie the point and village of Silupa, with anchorage south of the point in 4 fathoms with room to swing, near the shore; to the southward the coast is bordered by reefs and shoals, and a great reef extends E.N.E. of the point.

Danger.—A shoal,* covered by 1½ fathoms lies between Dayana island and point Igat; from it the western Cherif island is in line with the highest part of Dakula; and Putili island on with the second hill of point Dayana.

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* Not shown on the chart, the points given not being identifiable.

Fatimo islands are clean and steep-to on the south side ; but on the north side, the bank which fills the head of the bay nearly dries at low-water. The entrance to Kumalarang creek, practicable for light craft at high-water, lies N. by E. of Fatimo islands.

Igat bay, to the north of Igat island, is well sheltered and safe. The shores of the bay are clean and steep-to, except to the N.E. where there is a shoal which projects 1½ miles to the S.W. The river Dumankilas enters here by several mouths : the locality is unhealthy. Putili islet, in the middle of the entrance, is steep-to. Igat island is separated from the main land by a narrow channel, near the eastern part of which there is a good watering place. Off the western end of Igat island, there is a narrow reef.

Danger.—In the middle of the bay south of Igat island, there is a shoal of white sand which uncovers at low water springs.

Coast.—From point Karabuka to point Dumankilas, the coast is clean and steep-to, except north of Triton island, which is a large rock surrounded by a narrow reef.

MALIGAI BAY, is bordered on the eastern side by a reef over which there is 3½ to 1¾ fathoms water, which reduces its available space by one half ; in this half the depth is 37 and 27 fathoms, and it is deep close to the edge of the reef. The village of Banganga is situated in this bay.

Banganian (Flecha) peninsula is traversed throughout its length by a range of hills, the highest of which, Alto de Flecha, can be seen 24 miles in clear weather. The west coast of the peninsular is clean and steep-to ; the east coast is bordered by a reef, and should not be approached within a mile.

Panikian island is low ; a shoal, covered by 7 fathoms, extends one mile S.S.E. of the island, and is very steep on its eastern side, no bottom having been obtained with 84 fathoms close to it. The channel between the islet and the coast is safe.

Anchorage.—During the N.E. monsoon vessels can anchor in the middle of the bay south of Alto de Flecha in 5½ to 9 fathoms ; water can be had at a rivulet about 1½ miles east of the anchorage. There is also anchorage in the same depth off point Flecha, but when the monsoon blows fresh, a heavy sea sets round the point.

ILLANA BAY is comprised between Point Flecha and Point Tapian, distant 40 miles. It is separated from Iligan bay on the north side of Mindanao by an isthmus 13 miles wide.

Rios Rock (Takut Masila) before the little port of Dinas is a circular rock of half a mile diameter. From its centre Mount Bakayuan bears W. ½ N., distant 4½ miles. Takut Parido, a rock smaller than Takut Masila, is said to exist outside that rock.

Port Dinas is of little importance; it is formed by an opening in the reef that borders the coast south of point Pisan: this reef is said to extend as far as point Dupulisan, and the coast here should be approached with caution. The entrance to port Pisan is only 2 cables wide, and it should not be entered without a pilot except at low-water with the sun and weather favourable for seeing the reefs. There is 11 to 13 fathoms water in the passage, and the anchorage is in 4½ to 5½ fathoms near the shore. The direction of the passage is with mount Sambulauan bearing N. 50° W.

The town of Pisan lies a little to the north of the anchorage, 2 miles from the mouth of the river of the same name. The country is marshy and unhealthy; during the rainy season the water rises to 5 feet above the surface of the soil.

There is also anchorage in a corner of the reef west of Sagayaran, one of the Tikala islands, in 9 fathoms.

Pagadian bay, in the north-west of Illana bay, includes the anchorages of Dupulisan and Tiguma. Before the entrance there are some coral banks, one of which is always uncovered, with passages between them and the shore to the northward and southward. The southern passage is preferable, being wider and more direct.

Point Dupulisan is bordered to the S.S.E. and to the west by a reef of 3 cables extent. There is anchorage west of the point in about 9 fathoms, sheltered from south and south-east winds.

Point Tiguma is fronted by a reef which extends along the coast to the E.N.E. The anchorage is near the coast in 3½ fathoms.

Coast.—From Tiguma, as far as Palak harbour, the coast is bordered in many places by a reef which extends to one or two miles from the shore; it contains many little bays affording anchorage; generally very near the shore. Several rivers and lagoons open into the bay, the shores of which are peopled with many villages. The native inhabitants, with the exception of those of Tiguma, are in general hostile to strangers, and it is prudent to take precautions whilst dealing with them, without doing so ostensibly.

Pinatayan bank consists of two reefs, parallel to each other, extending 4 cables in a S.S.E. and N.N.W. direction; it is one cable wide, with a depth of 11 to 22 feet on it. From the eastern part of the bank the north point of Bongo island bears S. ½ W., and point Matimus of Tetian E. by S. ¼ S.

Tugapangan

PALAK HARBOUR,* between point Panga to the north, and point Mariga-batu (Red rock) to the south 4 miles distant, is open to the westward, and protected from the winds of that quarter by Bongo island before the entrance. The harbour is of good depth and safe. On the north side it contains the bays of Kidamak and Segut, and on the south side a wider bay in which are the anchorages of Palak and Parang Parang.

A steep coral reef fringes the coast; on the north side it is very close to the shore; on the south side it extends to 2 or 3 cables from it; and south of Segut Bay it projects about 1½ miles to the S.W. The depth at the entrance is over 40 fathoms; within, it ranges from 25 to 15 fathoms; and alongside the fringing reef about 5½ fathoms. The entrance presents no difficulties: a small detached hill at the bottom of Parang bay serves as a good mark.

Palak town, deriving its name from the Moro word *palak*, separated, is situated on the island Palak, which forms the northern point of the bay, and is separated from the main land by a narrow channel, Sampinitan, with only 1½ feet of water in it at low-water. The town is the residence of the naval commandant, and contains a population of 520 souls (1879).

Anchorage.—Large vessels should anchor S.E. of the buoy at the end of the reef, which projects eastward of the mole, in 16 fathoms. Small craft can anchor at the entrance of the Sampinitan creek in 9 fathoms; in that position they should moor in order to keep a clear anchor. The reef near the settlement is marked by beacons.

Parang Parang river can be entered by boats with difficulty; the water in it is good and abundant; a Moro town is on the north bank.

Segut bay is half filled by a reef; a village lies on the west coast.

Kidamak bay contains a small native population; the eastern point has a small reef off it; there is anchorage on the eastern side of the bay in 8 fathoms.

Winds.—In Palak harbour during the first months of the year, when the wind is well established from the N.E., there are often squalls in the afternoon from the north, accompanied with much lightning, wind, and rain : before the squall begins the wind blows from north-west and west, and after it is over the land breeze sets in until 9 in the morning. During the S.W. monsoon the wind freshens after mid-day, and varies from S W. to W. and N.W. ; rain falls in abundance, and heavy thunderstorms occur.

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* *See* Admiralty plan:—Ports in Philippines, No. 957, Palak harbour, $m = 1{\cdot}5$ inches.

Tides.—There are always two tides in the day with rare exceptions, which take place in the quarters of the equinoxes when the moon is at her greatest declination. The mean "establishment" is 6h. 5m. ; springs rise 8 feet, neaps 4½ feet.

Tidal streams.—The stream turns at high and low water at Palak harbour, and at all the ports on the coast between Samboanga and Palak. On the coast, with the rising tide, the stream sets to the north, north-west, and west, according to local configuration. At Palak harbour, with the rising tide, the stream sets to the east on the north shore, and follows the bend of the coast to the southward and westward ; the ebb stream sets in the reverse direction.

Bongo island, at the entrance of Palak harbour, is about 5 miles long N.N.E. and S.S.W. by 1½ miles wide ; it is some 300 feet high, and thickly wooded. The island is surrounded by a reef, which projects as much as 2 miles W.N.W. of the north point of the island, while, on the eastern side, the reef is narrow and very steep-to ; there is no good anchorage off the island. The channel between Bongo island and Panga point is 4½ miles wide, and 30 to 40 fathoms deep.

Volcanoes.—The cordillera of Sugut (Bangaya) lies about 23 miles to the eastward of Palak harbour ; the highest mountain of the range is the volcano of Makaturin, the latest eruption of which occurred in 1872. This eruption was followed by an earthquake which partly destroyed Palak, Kota-batú, and the villages on the banks of the river Mindanao.

MINDANAO RIVER.*—This great river disembogues 5 miles to the south of Palak harbour by two wide arms, on the northernmost of which is the town of Kota-batú, about 5½ miles from the mouth. The river is navigable for 60 miles by vessels of 3½ feet draught ; it flows through a beautiful valley 30 miles in width, which scarcely shows any change of level ; the valley is capable of producing tobacco, cacao, sugar, maize, and cotton ; but this is only known at present by specimens produced. The course of the river lies S.E. for 45 miles from its mouth to the lake Ligauasan, out of which it is seen to flow; from the other side of the lake the direction of the river is N.N.E. to its source in the Sugut mountains. At 21 miles from the northern mouth the river divides into two arms which enter the sea 4½ miles apart, and between them form a great delta. These branches communicate with each other by four small channels. The northern arm is the widest, deepest, and most navigable; the southern one is narrow, and has only 5 feet of water. The river banks are peopled by Moros.

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* *See* Admiralty charts, Celebes sea, Eastern part, No. 2,575 ; scale, $m = 0{\cdot}1$ of an inch. A chart of the river Mindanao is now in course of preparation by the Madrid Hydrographic Office.

Entrance.—Point Panalisan, the northern point of entrance, is surrounded by a shoal extending half a mile to the westward. The entrance channel, which is south of this shoal, is 16 feet deep, and very narrow. Off the south entrance point a sand spit extends 2 cables to the N.W., and is steep-to. The bar, which is in front of Painan village, has 5 feet over it at low water. After passing the village the depth increases, and 16 to 20 feet can be carried as far up as Kota-batú.

A bank, covered by 2¾ fathoms, with 9 to 16 fathoms near its outer edge, extends south-west from the northern entrance to a distance of 1½ miles from the coast, and joins the shore again near the wooded hill of Timako.

The southern entrance of the river is divided into two arms by an islet which cannot be passed on the south side; the northern arm has only 5 feet of water in it; at 3 cables to the west of this entrance the depth is 14 fathoms.

Beacons.—A *red* beacon or buoy marks the extremity of the north sand-bank of the entrance; a *white* beacon or buoy marks the extremity of the south sand-bank of the entrance.

A *white* and *red* beacon or buoy marks the head of the shoal between the islets.

A great tripod and white cage stands on Bulusan point, and serves to distinguish the mouth of the river from other entrances on the coast.

Kota-batú town (Stone-fort) is now the capital of the island, and the residence of the Governor-General of Mindanao; it is connected with Palak harbour by a causeway of stone. The river is 16 feet deep off the town, and vessels can anchor in it, taking precautions to avoid the snags carried down by the current. Steamers call fortnightly.

Coast-marks.—Timako island, between the two mouths of the river, is wooded to the water's edge. The hill upon it, mount Timako, is a good mark for marking the river. An elevated range of volcanic mountains, dominated by the central peak Dikalungan, extends some 70 miles to the southward, nearly parallel to the river Mindanao. The peak Kabalala, on which is a *cogonal*, 3½ miles from the southern entrance of the river, and higher than the neighbouring hills, is another good mark for the river.

COAST.—From the south entrance of the river Mindanao the coast trends about S.W. for 23 miles to Kidipil point, the most salient point of this part, and is clean and steep-to. Point Tapian, midway, is low and surrounded by a reef reaching out 3 cables. From Kidipil to Tinaka point, the southern extremity of Mindanao, the coast is generally clean and steep-to with good depths off it, and includes several little bays; it, however, has not been surveyed, and should therefore be approached with caution.

Linao bay is 1½ miles wide, and sheltered from all winds but those from the S.W. Its shores are bordered by a narrow, steep reef.

Huidobro shoal, called Linao shoal by the Moros, is placed on the chart 3 miles W.S.W. of point Linao; it is said to be covered by 5½ fathoms of water.

Port Lebak,[*] between points Lebak and Nara, offers good shelter in all weathers, but a sea sets in with westerly winds. The shores are covered by mangroves and bordered by a reef which extends to about one cable from them. The best anchorage is in 11 to 13 fathoms to the eastward of the islet and reef Tubotubo in the southern part of the bay. Water can be obtained in the river Lebak, east of the anchorage, and also from the other rivers in the port. The natives are said to be in the habit of using poisoned arrows on the smallest pretext, it is therefore well to be careful, and not to trust them too far.

Basiauang bay[†] affords two anchorages; that to the northward of the bay, and east of point Basiauang affords good shelter in all weathers, but it is necessary to secure to the shore, as there is not sufficient room for a vessel to swing. The southern anchorage is at the mouth of a small creek on the northern side of a remarkable hill, connected with the mainland only by a low mangrove covered neck. The anchor can be dropped in 10 to 13 fathoms, and the stern secured to the reef. The reef at the point, and the neighbouring island of

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[*] *See* Admiralty Plan of Ports in the Philippines, No. 957; Port Lebak; $m = 3$ inches.

[†] *See* Admiralty Plans of Ports in the Philippines, No. 957; Basiauang bay; $m = 3$ inches.

Donauang break the sea, and these anchorages of Basiauang, after port Lebak, are the best shelters which this coast offer in all weathers.

The island Donauang has a reef which reaches 2 cables out to the N.N.W. The passage between Donauang and the coast is safe; a vessel should keep nearer to the island reef than that off the coast, which is more extensive.

Donauang shoals are two shoals situated respectively 3 miles N. 9° W. and 2 miles N. 3° W. of the north point of the island; they are each about half a mile across and covered by 3¾ least water.

Tuna bay is semicircular, steep-sided, and bordered by a reef like all the bays of this coast. There is anchorage in 15 fathoms in the N.W. part, before coming to a point covered with mangroves from which a reef projects; a small anchor should be laid out on the reef, as is well to be done in all these bays with steep sides.

Danger.—A reef which uncovers in places, and is covered by 5 fathoms in other places, lies 2 miles off the coast, and 5 miles S.E. of point Malatuna. Vessels should not approach this part of the coast within 6 miles.

Coast.—Point Pola, 18 miles S.E. of point Malatuna, is low, with a sand beach and small reef. At 5 miles to the east of point Pola lie the village and river of Kraan (Kanaren) near which layers of coal have been found. As far as Sarangani bay, the coast is generally low, and offers no good shelter.

Point Bukud, formed by the hill of the same name, lies 16 miles S.E. of point Pola, and terminates in an islet united to it by a narrow reef. The hill may be easily recognised, being isolated in low land; seen from the west it suggests the form of a table.

Point Bul, 20 miles E.S.E. of point Bukud, is surrounded by a reef which is said to extend one mile out.

A reef, 2 miles long, and one mile wide, covered by 5 fathoms water, lies off the coast east of point Bul, and 3½ miles S.W. by W. ½ W. of point Bulaluan, the western point of Sarangani bay.

SARANGANI BAY has a width of 7 miles at its entrance between points Bulaluan and Sumban; its sides are very steep and its depth considerable; anchorage may be found in the bights of its coast-line, but close to the shore, and with a hawser out to the shore to prevent the anchor slipping into deep water. A coral reef extending one mile out, surrounds point Bulaluan, and borders the western and northern shores of the bay. The west coast is arid, the plains to the north-west and north are covered with *cogon* and abound in deer.

The volcano Matutung which lies 19 miles* N. by E. of the town of Mlut in the N.W. angle of the bay, is very high, and can be seen from a great distance.

Mlut anchorage is in the angle of the bay north of the town, in 15 fathoms. Good water can be obtained from the river. Communication between Mlut and lake Buluan across the mountains occupies two to three days.

Glan Masila or **Kanalasan anchorage**,† though steep, is the best anchorage in Sarangani bay during the S.W. monsoon; it is in Kanalasan cove, east of Sumban point, before the village of Glan. Anchorage may be had in 11 to 13 fathoms, with a hawser to the shore; but it is advisable not to anchor before the mouth of the river Glan Masila, which flows into the northern part of the cove, on account of the freshets. The town of Glan Masila (Great Glan) stands on the bank of the river, 2 miles from the mouth.

LIGHT.—A fixed *white* light is exhibited on the mole on the south side of the entrance of the river; it is elevated 33 feet above the sea, and should be seen in clear weather at a distance of 6 miles.

Point Sumban is high and steep, with but little vegetation on it; it is surrounded by a reef extending 2½ cables to the west and north.

THE SOUTHERN PENINSULA of MINDANAO is high, and presents several remarkable peaks on it; the southern hill, 1,670 feet high, and in reality round, looks somewhat like a pyramid when seen on an E.S.E. or W.N.W. bearing. Seven miles to the N.N.E. of this round-topped hill is a saddle peak, 3,600 feet above the level of the sea; and 8 miles N.E. of this saddle mountain there is a high range, the highest peak of which, 4,530 feet, has a conical top when viewed from the southward.

The west coast, from point Sumban to point Tinaka, is generally clean, except near Bluff point, or Talayan point, where the reef extends nearly a mile out. Point Tukapanga is rocky, high, and steep; a reef follows the coast to the S.E. from it to Batulaki.

Point Tinaka, or **Cape Sarangani**, is a hill united to the coast by low land; it presents a bluff point to the south with a little sand-beach, and may be passed at half a cable's distance; to the eastward of the point there is a large shoal of sand and rock, covered by 5½ fathoms.

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* 9 miles by the Spanish Derrotero.

† *See* Admiralty Plan, Ports in the Philippines, No. 957; Kanalasan Cove.

Anchorage.—On the western side of Tinaka point there is a little bay, Batulaki, open to the south-west and fringed by shoals, which reduce the available space to a width of 6 cables, with a depth of 9 fathoms, lessening gradually to 2½, over a clean sandy bottom. Safe anchorage may be found in this bay, sheltered from the N.E. monsoon. The roadsteads of Balangunan and Malavinan to the eastward of Tinaka point are exposed to the sea, and afford very indifferent anchorages.

The coast.—Gual point is low and sloping, with a little reef off it. Points Kamalian and Silakai are foul. Butulan offers temporary anchorage out of the swell of the sea, but exposed to the sea that sets in from cross tides. The depth is great, with 14 fathoms almost touching the shore, and 10 fathoms before the mouth of the river. The coast continues clean and sloping, and almost straight to point Banos, which is about 72 feet high and peaked. From here it runs N. by E., with a series of high points to point Kalian, which is broad and rather remarkable. There is good anchorage off Kalian.

Tides.—It is high water, full and change, at Sarangani point at 7 hours. Springs rise 6 feet. The flood stream sets to the west between Tinaka point and Sarangani islands, and the ebb to the east. On the coast to the northward and eastward it is said that the flood stream sets to the north, and the ebb to the south, the latter being less violent than the flood; also that to the northward of point Kalian the tide streams are weaker. Strong tide races and violent eddies are prevalent, especially off Banos point.

SARANGANI ISLANDS consist of two islands and a sand cay, situated 7 miles from the south point of Mindanao. The two islands are separated by a deep channel 1¾ miles wide, reduced by a reef on the east side of Balut island to a navigable passage 8 cables wide. In this channel the tide-streams are very strong, the flood stream setting to the north and the ebb to the south. A shoal, covered by 7 fathoms, lies nearly in mid-channel, three-quarters of a mile from the coast of Sarangani.

Balut island, or **Balut Masila,** the westernmost of the two, is the highest and most cultivated; its population amounts to 1,500. In the centre is a volcano 3,050 feet above the sea*; from which smoke sometimes issues: seen from the N.W. it appears between two peaks. In the south-western extreme there is another volcano, and in the S.E. a hill 1,082 feet high. The north and east coasts are bordered by a reef, which in some places extends out over a mile, while on the south and west sides the fringing reef does not extend to any distance; off the south-west end is a rock 40 feet high. Point Lajan, the north-east point of the island, is low and covered by mangroves; about 1½ miles to the south of the point there is anchorage in 13 fathoms, sheltered from the S.W., but quite exposed to the sea from the N.E.; this is the only anchorage in the island. There is a hot spring on the shore here, covered at high water.

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* 2,350 feet in "*Challenger*" report, Vol. I., page 667.

Sarangani island, or **Balut Parido,** is composed of small undulating hills 490 to 820 feet high, covered with vegetation. There are three sheltered creeks on the west coast; the east coast is very foul.

Port Patuko, close to the north extremity of the island, offers sheltered anchorage in 8 fathoms; the stern of the vessel should be secured to the shore. The entrance may be recognised by a cliff of red earth a little to the northward of it: the channel is narrowed by reefs on both sides. Point Tiain, one mile S.W. of port Patuko, may be recognised by white lime stains upon it; it can be approached with safety. An unconnected patch, with 4½ fathoms on it, lies N.N.E. a quarter of a mile from point Tiain, and west of the entrance of port Patuko.

Port Tumanao, one mile south of point Tiain, has 25 fathoms depth at the entrance, diminishing to 9 fathoms at the bottom. Water can be obtained from a small rivulet in the S.E. part of the port. Port Bolai is very small, and only fit for very small craft; neither wood nor water can be obtained.

Olanivan islet (Lambul) is a small flat cay with trees on it, about a quarter of a mile across and 60 feet high, lying one mile N.E. by N. from the north point of Sarangani island; it is surrounded by a coral reef with 13 fathoms off its south-west edge. Between this reef and that fringing the north point of Sarangani is a narrow channel, which appears navigable.

DAVAO GULF has its entrance between Kalian point to the west and cape San Augustin to the east, some 30 miles apart; it runs 60 miles inland to the northward. The island Samal nearly fills up the northern part of the gulf. The shores of the gulf are, in general, clean and steep-to, but they have not yet been surveyed, and great discrepancies will be found among the existing charts. Much caution must therefore be used in navigation here.

West coast of Davao gulf.—From Kalian point the coast runs nearly north for 36 miles according to the English chart—N.N.W. by the Spanish chart—as far as Kasilaran bay, at the bottom of which is port Malalag; and from thence N.N.E. for 26 miles as far as the river Davao or Vergara. The entire length of the coast is clean, and the water is very deep near the shore. Reefs project from the shores of Kasilaran bay, and port Malalag, which is stated in the Spanish Derrotero to be capable of holding vessels of any size; is said in the Annuario Hidrografico for 1887 to be foul, and to require great care in entering.

Davao river and town.—The town was founded in 1847, and had in 1879 a population of 920 persons. There is a bar at the entrance of the river covered by 4½ feet of water at low-water springs. The channel is marked by two buoys, one painted black, the other white; within the bar there is a depth of 7 feet over a muddy bottom. When entering, the southern shore should be kept until a little creek opens on the port hand; then the northern shore should be hugged, as it is safe and very steep-to, while great banks of sand project from the southern shore.

LIGHT.—A *fixed red* light is shown from the northern entrance point of the river; it stands on an iron lighthouse, erected on stone foundation, coloured leaden grey, 27 feet above the sea; it should be visible at a distance of 10 miles through an arc of 240° from N. 9½° W. to S. 69½° E.

Anchorage.—Temporary anchorage may be found on a bank in 8 fathoms water, on a bank of sand at a distance of one cable from the mouth of the river; but the best anchorage is farther north at 4 cables from the mouth of the river, in front of some dead trees, in 11 fathoms, with the channel between the islands Samal and Talikut open, and point—or rather island—Dumalag shut in by point Kabakam. The bottom is exceedingly steep, and a shoal of sand projects to 3½ cables from the beach. These anchorages are good with northerly winds, but with the gales that occur during the S.W. monsoon, a heavy sea sets in, and then it is better to pass through the channel between Samal island and the main coast, and seek shelter near Pakiputan point, 5 miles north of Davao.

The fortnightly steamer from Manila, Samboanga, and Palak, calls at Davao. Fresh provisions can be procured at Davao.

Tides.—At Davao there are two high and two low tides daily, affected however by diurnal inequality both in time and height. The mean "establishment" is 6h. 5m. Tides range from 4 to 7 feet. The stream turns nearly at the time of high and low water. (*See* App.)

Samal island is about 19 miles long, N.N.W. and S.S.E., and

11 miles across the widest part. It rises in the north to a hill 820 feet high, sloping gradually to the south by a series of hills of lesser height. The shore in many places is low, wooded, and fringed by narrow sand beaches, and in those places landing is practicable; but in other places where it is broken up by rocky cliffs, the shore cannot be approached. The soil is fertile and excellent timber abounds. An islet with three high trees on it lies S.S.W. 6 cables from the N.W. point of Samal, and is united to the shore by a bank of sand and rock covered by 3 feet at low water; a reef which partly uncovers at low water lies 3 cables south of this islet, and between the reef and the Samal shore there is anchorage in 4 fathoms water. During the N.E. winds shelter can be found in a wide bay between Linao point and Binulin river, nearly opposite Davao, in 8 to 11 fathoms. Malipano anchorage, 3 miles to the southward of Binulin river, is small, being confined by great reefs which leave only a difficult entrance; the entrance can be made out in clear weather, but at other times a pilot should be taken. Water can be obtained from a stream.

Talikut island, separated from the south-west part of Samal by a navigable channel one mile wide, is low, wooded, and marshy, lacking fresh water and uninhabitable. It is bordered by sand banks and rocky shoals which are more extensive on the side next Samal island, from the middle of the channel towards the southward. This part of the shore should not be approached within 4 cables.

Cruz islands, off the north coast of Samal, are separated from it by a safe channel.

Pakiputan strait, between Samal and the main coast, should not be taken by a sailing vessel unless the wind is free, so that she can stem the current which runs generally with a velocity of 2½ miles an hour. The strait is too narrow for a vessel to work in, and the coast of Mindanao is foul. The flood stream sets to the north, and the ebb to the south; there are generally counter currents, both on the coast of Mindanao and of Samal, and these are strongest when the tide is weakest, and they are not felt at all at springs. These currents can be made use of by masters of vessels having local knowledge.

Coast.—From Pakiputan point, which is covered by trees and dense mangroves, the coast runs nearly N.N.W. for 8 miles, and then N.E. as far as the river Hijo, and it is low all along here; anchorage may be found anywhere off it. The rivers Panakan and Lassan are fronted by bars with very little water over them; fresh water can be obtained from these rivers. A low, isolated hill, presenting 8 distinct peaks, rises between these rivers, and this hill is the only mark on the coast.

Tagun river, which enters between low banks covered with mangroves, has 10 feet of water on the bar at low water, and 23 feet within the bar. Schooners can ascend the stream for 5 miles; a large town is situated some distance up the river.

Hijo river enters the sea 4 miles E.N.E. of Tagun. It has very little depth of water on the bar, but is very wide to as far as 2 miles from the mouth. The banks of the river are low, marshy, and covered by mangroves. The town of Hijo is the most important in the gulf, and is said to contain a large population.

Kopia and Pandassan islands lie respectively S.S.E. 3 miles, and S.E. by S. 4 miles of the mouth of Hijo; they are covered by trees and mangroves, and are united together to the south-west by a reef. The passage between them and the main land is only practicable by schooners. There is anchorage between the islands.

East coast of Davao gulf.—From Hijo river the coast runs nearly S. by E. according to the English chart as far as cape San Augustin. It is in general steep-to, and the reefs that border the various points along it do not extend more than 2 or 3 cables to seaward. Anchorage may be found in the indentations, but exposed to the swell which sets in with southerly winds.

Sigaboi is only a small village; according to the Spanish Derrotero there is a road from the village to Pujada bay 7 miles distant on the east coast of Mindanao; and wild cattle are both plentiful and cheap. There is anchorage in 4 fathoms sheltered from southerly winds; the coast to the southward is foul.

Sigaboi island, separated from the main coast by a narrow channel, is covered with low wood and mangroves, and surrounded by foul ground. In December 1861, H.M.S. *Sphinx*, after searching for anchorage at Anunanga,* and finding no bottom with 50 fathoms line at a quarter of a mile from the shore, anchored S.S.E. ½ E. of Sigaboi in 18 fathoms, and found this anchorage very indifferent, with depths of 3½ and 20 fathoms within half a cable's length. Wood was cut for burning in the furnaces, white and red poon, very hard and dry.

Burias shoal is circular, 3 cables in diameter, and lies 5 miles

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* Anunanga does not appear in the present charts, which give Kabitoagan in the position formerly occupied by Anunanga.

N.N.W. of Sigaboi island, and 1½ miles off the main coast. There is no further information about this shoal, except that the sea breaks over it.

Lanigan anchorage, 2 miles north of cape San Augustin, is only fit for very small craft; it is partly sheltered from northerly and southerly winds by shoals on which the sea breaks. Good water can be had from a ravine to the southward of the anchorage.

CAPE SAN AUGUSTIN,* the south-east extremity of Mindanao, is formed by an agglomeration of black rocks with trees on the summit. A circular shoal of sand and rock, 4 cables in diameter, covered by 9 feet of water, lies off the cape.

Large vessels should not come within 3 miles of the cape in bad weather, as there is always a heavy sea caused by the tidal streams and eddies off it. Small vessels, on the other hand, should close the cape and pass within a cable's length of the narrow reef that fringes it, so as not to be carried away to the southward by the current. The only shelter for large vessels is in Pujada bay. *See* Page 352.

CURRENTS.—Off cape San Augustin there appears to be a strong constant current to the south-west: in December 1861, H.M.S. *Sphinx* was set S. 44° W. 42 miles in 16 hours; in February 1875, H.M.S. *Challenger*, after passing to the eastward of the Sarangani islands, experienced a set S. 16° W. 38 miles in 24 hours; and in May 1882, H.M.S. *Lily* experienced a set S. 55° W. 65 miles in 24 hours.

ISLANDS BETWEEN MINDANAO and CELEBES.—Palmas and Hunter islands.—Palmas is placed on the Admiralty chart in latitude 5° 30′ N., longitude 126° 28′ E.; Horsburgh places it 3 miles to the westward of this position. It was sighted by H.M.S. *Sphinx* in December 1861, and placed by her 11 miles N.E. of the charted position.

In 1885 S.M.S. *Stosch* passed 5 miles to the westward of the assigned position of Hunter island without seeing it. It is highly probable that Palmas and Hunter islands are one and the same island, with different localities assigned to it.

NANUSA ISLANDS (Meangis of Dampier).—The following

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* The geographical position of cape San Augustin has not yet been fixed. It has been placed by various authorities as follows :—

English and Spanish charts - -	Lat. 6° 14′ N.	Long. 126° 05′ E.
Raper and H.M.S. *Sphinx*, 1861 -	„ 6° 07′ N.	126° 13′ E.
Horsburgh - - - - - -	„ 6° 17′ N.	126° 00′ E.

report is from the *Challenger*, which passed to the leeward of them in 1875, and dredged in 500 fathoms.

"**Nanusa island** (Merampi), rises gradually from the shore, and is rounded gently at the summit, which appears bare, with the exception of some coco-nut palms along the ridge. Maroka, or Sueste island, a small peaked islet, 266 feet high, is the southernmost of the islands eastward of Kakarutan. The other islands of the group are low and flat, but, being densely wooded, can be seen at a considerable distance. There are coco-nut trees on both of them." The group was surveyed in 1886 by the Dutch gun-boat *Bali*. All the islands are shown to be surrounded by reefs, and the three southern islands stand on one reef. The chart also shows a reef between Karaton and the northern island, another 4 miles south of Karaton, and another between the central and southern group. Karaton island is said to be generally flat, but with a peak 200 feet high on its northern side, and to afford indifferent anchorage on its south-western side in 17 fathoms, sand, with the village of Karaton, bearing N.W. by W., distant a quarter of a mile, and the N.W. point of Merampi N.E. by N. This is said to be the only anchorage among the islands, and is used by the Molucca trading steamer and the Government inspecting vessel on the rare occasions of visits to these islands. The number of inhabitants is 1,130, living by fishing and cultivating maize and yams. Water at Karaton is very bad; it comes from an inland spring.*

Current.—During the whole time the *Challenger* was dredging, 8 hours, there was a constant current to the south of one mile an hour.

TALAUER ISLANDS are under the residency of Manado. Karakelang, the northernmost of the group, is shown on the Dutch chart of 1888 as 34 miles long north and south, and 13 miles wide at the northern part, and to have its southern side fringed by a reef nearly a mile wide. The southern part of the island is reported to be about 2,300 feet high. The trading steamers anchor off Beo, a town on the western side, at a quarter of a mile from the shore.

Salibabu or **Lirong island** has a table-hill on it; the bay and anchorage Salibabu† are situated on the south-east side, fronting

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* *See* "A Naturalist in North Celebes," by Sydney J. Hickson, D.Sc., who visited Karaton in the Dutch steamer *Ternate* in 1885. Dr. Hickson states that three only of these islands are inhabited; Karaton, Merampi, and the small island Ourata near Maroka.

† *See* Admiralty plan, anchorages between Borneo and New Guinea, No. 930, Salibabu anchorage; scale, $m = 2{\cdot}9$ inches.

Kaburuan island, having irregular soundings of 10 and 20 fathoms, rocky bottom, near the shore, and 20 to 40 fathoms, sand, about a mile off. There are many coral reefs in the bay, with deep water at their edges; and in the northern part of the bay or harbour there are breakers, and the depth is less than one fathom. The best anchorage in the road is from 15 to 30 fathoms, sand, about S.E. by E. of Salibabu village, and half a mile from the northern shore.

Coming in from the southward, a berth must be given to a spit that projects more than half a mile from the shore, about half-way between the point and the harbour, on which the water shoals from 7 to 3 fathoms. From the eastern point of the island a spit projects with 30 or 33 fathoms near it, which depths continue round the point along the north side of the island to the village Lirong, situated 2 miles to the N.W. of that point, and facing the south end of Karakelang. There is fair anchorage in 10 fathoms off the village, about 3 cables from the shore, but it is exposed to the tide, which is strong. The Dutch trading steamers anchor off Lirong, and do not call at Salibabu anchorage.

Supplies.—Hogs, goats, fowls, and sweet potatoes can be procured at Lirong, and there is a store kept by a Chinaman.

Kaburuan, the southernmost island, is low, but it has an insignificant peaked mount on it. The Dutch trading steamers call at Mengarang on the western side, but do not anchor.

Danger.—Northumberland shoal is shown on the Dutch chart as lying 6 miles S. by E. ½ E. from the south point of Kaburuan; in the middle of the breakers a small patch of sand appears above water, and the extent of the shoal is about 2 miles N.N.W. and S.S.E. The captain of S.M.S. *Stosch* reported in 1883 that the bank extends further east and south than shown on the chart. There is a channel between the shoal and Kaburuan island.

The KAKARALONG ISLANDS are reported as being six in number, besides four shoals, between latitudes 4° 40′ N. and 4° 10′ N., and longitudes 125° 3′ E. and 125° 45′ E.; viz. Araiga or Saddle island, Meares or Haycock islands (two), Anda, Armadores, and Saravia or Kabalusu.*

Churruca shoal was reported in 1881 by the *Churruca* as lying with Anda island bearing south and Ariaga island bearing west. Marie was reported in 1884 by the German bark *Marie* to be composed of sand extending nearly one cable in an east and west direction, and showing the sea breaking heavily upon it. It lies with Anda island bearing S.S.E. ¼ E. distant 10 miles. Between Churruca shoal and Anda island strong eddies are reported to exist. Iphigenia rocks are shown on the Dutch chart of 1888 as lying 7 miles S. by E. of Armadores, and Haycock bank is shown on the same chart 16 miles W.S.W. of Kabalusu island.

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* Also named Haycock island in charts previous to 1888.

Lipang island is shown as lying 14 miles N.N.W. ¾ W. of the north point of Sangir island, and Louisa bank 4 miles N.W. by N. of Lipang island.

SANGIR ISLANDS.—Under this name the Dutch include Sangir and all the islands southward to Biarro. They are of volcanic formation, and through them we trace the great volcanic band from the Malay to the Philippine archipelago. Sangir itself, the principal island of the group, is 24 miles long N.N.W. and S.S.E. It is under the residency of Manado in North Celebes, and is governed by the native Rajahs under the direction of a Controlleur who is stationed at Taruna. There are a few Europeans and Chinese on the island, and in 1884 there were in the two groups, Sangir and Talauer, 29 government schools and 23 missionary schools.*

Sangir is of moderate height in the southern part of it, but the northern part consists of high mountains; among them, a smoking volcano, mount Abu, at the north-west end, is the principal peak. A destructive eruption of mount Abu took place in March, 1856.

On the western side of Sangir the two bays Taruna and Manganitu afford anchorage; while on the eastern side there is said to be anchorage south of Tabukan and in the bay of Miutu, but there is no information about them, nor is there any information to hand about the small islets adjacent, on the N.E. and S.E. sides of the island.

Taruna bay† runs in about 1¼ miles in an E.N.E. direction with a uniform width of half a mile; it is surrounded by wooded hills about 800 feet high. The northern side is clean except in the north-east corner, but the south side is fringed by a narrow reef. The depth is over 50 fathoms at one quarter of a mile inside the entrance, shoaling gradually to the head of the bay. The town is on the north side of the bay, and has a population of not more than 1,000 souls. The trade is almost entirely copra, but sago, banana, rice, maize, and cotton are produced, and the timber is said to be very good for building.

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* A comprehensive history of these islands, and a description of the natives will be found in "A Naturalist in North Celebes," by Sydney J. Hickson, D.Sc., 1889.

† *See* Admiralty plan, anchorages between Borneo and New Guinea, No. 930. Taruna bay; scale, $m = 2{\cdot}2$ inches.

The anchorage is in 40 fathoms, black sand, with the northern entrance head bearing nearly W., the flagstaff of Taruna N.W., and a remarkable tree at the head of the bay E. ½ N. It is said to be safe in both monsoons.

Supplies.—No fresh provisions can be relied on; there is no information about the watering place; a branch steamer of the Netherlands India Company calls here about once a month but at irregular times.

Manganitu bay,* about one mile to the southward of Taruna bay, is also surrounded by hills 800 feet high. It is 1½ miles wide between the entrance points, the available space, however, being reduced to one half by an extensive reef that borders the southern and eastern shores. A detached reef is reported (1890) to lie with islet bearing E. by N. ¾ N., and the edge of Kalangan N. by N. ¾ W.

The native town Manganitu is on a river near the head of the bay, before which there lies a bank with a little island on it; landing is difficult. The anchorage is in 24 fathoms about half a mile from the shore, with the native town bearing E.N.E., and the southwest point of the bay S. by W. Good water is procurable.

Tides.—It is high-water in Manganitu bay at 5 hours; springs rise about 6 feet. The tide stream is weak and irregular; there appear to be four tides in the 24 hours. Along the coast the tide streams are said to reach the rate of 2 miles an hour.

Karakita or **Passage islands,** consist of six or seven islands and several rocky islets, lying between the south end of Sangir and Siau, separating the channel into two branches. The northern branch or passage between Kalama and Kima off the south end of Sangir is 8½ miles wide and considered clear of danger. The southern channel between the rocks Sangaluan and the northern point of Siau is also reported clear; but as the vicinity of these islands has not been examined they should be approached with caution.

Siau island has a remarkable range of volcanic cones, perfectly distinct from each other. The northern one is an active volcano 5,924 feet high; the other three are lower, decreasing gradually to the lowest in the southern part of the island, where, to the southeast, the land appears much broken up. There is good anchorage off

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* *See* Admiralty plan, anchorages between Borneo and New Guinea, No. 930, Manganitu bay; scale, $m = 2{\cdot}2$ inches.

Ulu on the eastern side, about 3 cables from the shore, beyond the eastern end of the village.

The islet Maboro, with smaller islets and rocks about it, lie on the east side of Siau; "rocks project from the S.W. point of Mandang, between which and the S.E. point of Siau there is an opening about a mile wide" (Horsburgh). This may refer to Pondang, of the later Dutch charts.

Makaleheh is round-backed and wooded, and can be seen 25 miles off.

Tagulanda island has two peaks, both round-backed, showing as one when seen from the south-east. The eastern and highest peak, 2,550 feet above the sea, is generally hidden by clouds during the S.E. monsoon; the western peak, 2 miles to the west of the higher one, is 2,450 feet high and more abrupt. From these peaks the island gradually slopes to the westward, and forms a point which is surrounded by a reef extending considerably to the north-west of it. The principal village and trading establishment is on the south side of the point. There is also a village in a bay on the northern side of the island, said to be frequented during the N.W. monsoon, when the western side is unapproachable. The southern and eastern sides are much steeper, and appear to have deep water off them.

Anchorage.—The Dutch steamers, which visit the island occasionally to collect copra, anchor outside the reef, three quarters of a mile S.E. by S. of the village, in 18 to 24 fathoms, with the eastern extreme of Roang island in line with the eastern extreme of Biarro.

Between Tagulanda and Roang islands there is a narrow channel not yet explored, through which the tide runs strongly; breakers were seen in it, but whether due to tide rips or rocks was not determined.

Roang island is formed by an active volcano, which rises in a cone to a height of 2,330 feet; three pinnacles rise from the edge of the crater, showing as two only when seen from the westward. The shores of the island appear to be steep-to all round, except in the channel separating it from Tagulanda; the eastern point is low, and there is generally a tide race off it. There is no water on the island, and it is only occasionally inhabited by fishing parties from Tagulanda.

Anchorage.—H.M.S. *Flying Fish* anchored, while taking observations, in 22 fathoms, at three-quarters of a cable from the black sandy beach on the N.E. point, but a slight swell setting in, her anchor slipped off the steep bank; vessels anchoring there should secure by a hawser to the shore.

Passigi island is about a mile long, north and south, and half a mile wide; it is flat, covered with trees about 100 feet high, and surrounded by a reef which extends to a quarter of a mile from its southern shores from S.E. to S.W., and 2½ miles to the N.E. There appeared to be an entrance through the reef on the N.E. side: the channel between Passigi and Tagulanda is clear and deep.

Biarro island is 5½ miles long N.E. and S.W., and 2½ miles wide; it is wooded and traversed throughout its length by a range of hills about 800 feet high, rising on the east side of the centre to a remarkable and precipitous hill with a thumb-like summit 1,245 feet above the sea. Off the S.W. point is a small wooded islet about 200 feet high on its northern side, sloping to the south-east. The western coast is broken by bays with islets before them. A pillar rock, 30 feet high, stands off the N.W. point, which is low, and should not be approached within 1½ miles, as a coral shoal here, which has not been surveyed, should be avoided.

On the north side of Biarro there is a wide bay which affords anchorage in the S.E. monsoon in 6 fathoms close to the reef, on the west side of the bay, with a small red-topped islet in line with the summit of Biarro, bearing S. by E., and the extremes of the bay N. 80° E. and 88° W. Care must be taken on approaching this anchorage as the water shoals suddenly, and the reef does not show when covered and when the water is smooth. About half a mile west of this anchorage is the entrance to a creek leading to a large village.

The N.E. point of the island consists of high cliffs with a pillar rock off it, and half a mile N.N.E. of it are rocks which uncover 3 feet at low water. The coast facing the S.E. is cliffy and steep-to.

NORTH-EAST COAST OF CELEBES.*

Banka island, which is inhabited, is 6½ miles long and 4½ miles wide, of irregular shape and densely wooded, with the exception of several clear spaces of coarse grass. The summit is on the eastern side, 1,135 feet above the sea; to the west of it are several cone-shaped round-topped hills, ranging from 600 to 700 feet high. The north point of the island is formed by low mangroves; a rock, 14 feet above high water, named Batu Kapal, rises at 2 cables from the point, and connected with it by a coral reef. The eastern point of the island is a sharp, conical, wooded hill 350 feet high, joined to Banka by a low neck of land, and jutting out to the N.E. in a succession of sharp needle rocks ; the outermost are surrounded by water, and are 15 to 20 feet high. The south point of the island is a low cliffy point, rising to a conical hill 280 feet high, with an islet of similar shape to the N.E. of it, from which a breaking reef extends more than half a mile with deep water close to it. There are heavy tide rips off the point, and a wide berth should be given to it. The west coast of the island is low, and fringed by coral, extending about a cable from the shore.

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* *See* Admiralty plan:—Anchorages between Borneo and New Guinea, No. 930; North part of Celebes island; scale, $m = 0{\cdot}36$ of an inch.

The western point of the island is a low dark red cliff with trees upon it ; to the eastward of it is a bay with soft muddy bottom, which is the only place among these islands where a ship can be beached. To enter it a boat should go ahead of the ship, as the entrance is intricate and narrow ; a small stream enters at the head of the bay.

Kinabohutan island is low and wooded ; there is a round hill about 60 feet high on its southern side. It is surrounded by a reef steep-to within half a cable of the S.E. point ; this reef extends to a third of a mile from the east shore, while on the north-west side it nearly joins the reef of Talisse island, leaving only a narrow channel of 3 fathoms depth, too narrow and intricate to be of any use. The channel between Kinabohutan and Banka islands is 3 miles long and one mile wide, and was constantly used by the *Flying Fish.*

Talisse is a high narrow island nearly 6 miles long with a central peak 1,168 feet high. It is thickly wooded, with patches of cleared land, and occupied, along with Kinabohutan, by the Molucca trading company (*Moluksche Handel Vermootschap*) who are growing coffee, cacao, vanilla, and coco-nuts. A species of iron-wood is also grown here, which will give straight piles 100 feet long, good for piers ; but it is too heavy for spars or for ship's use, and will not float in sea-water.

The north-east point of the island, Tanjong Aros, is a bold cliff with large broken rocks at its base, and steep-to ; the north side is fringed by a coral reef which extends generally to a quarter of a mile from the shore with deep water close to it. The south-west point, Tanjong Bung, is of sand and mangroves with a great square rock off it, 10 feet above water ; the reef off it extends to nearly half a mile to the westward, but only a quarter of a mile to the southward. The south-east point is a sand spit, with a reef off it which projects a third of a mile to the eastward. From the S.E. point to the station, 1¾ miles to the north-east, the shore is low, covered by mangroves and fringed by a reef one to 2 cables wide.

Talisse roads,* between the S.E. point of Talisse island and the island Kinabohutan, affords good anchorage in 10 to 12 fathoms, with the wooden jetty bearing about N.W. by W. and the northwest tangent of Kinabohutan island N.E. The jetty is of wood, too slightly built to secure ships to ; the piles are not coppered and in 1886 were so decayed that the jetty was not safe. The depth at the end is 4 fathoms at low water, and at 20 yards from the end there is only 6 feet. The house of the manager of the Molucca trading-company is near the jetty.

Shoals.—To the north-east of the jetty the fringe reef extends generally to little more than a cable from the shore ; but at one-third of a mile E. ½ N. from the shore end of the jetty, there is a patch of 9 feet at 2 cables from the shore with 6 fathoms close to it, and at three-quarters of a mile in the same direction there is a patch detached from the Kinabohutan reef with less than 6 feet on it, towards which the flood stream sets strongly.

Clearing mark.—Cape Coffin, in line with the western tangent of Banka, will clear the coral shoal west of Kinabohutan.

Tides.— It is high-water in Talisse road full and change at 6h. 45m. ; springs rise 7 feet, neaps range 5½ feet. The flood-stream sets to the northward between Talisse and Banka, and to the westward between Talisse and Tindila.

Supplies.—None to be depended on, but sometimes cattle are put on the island to graze, which can then be purchased : vegetables come from Likupang. Water is obtained from a stream at the back of the manager's house, but the supply is scanty and liable to be contaminated. In 1886 there was a small quantity of coal for sale, but the supply was not likely to be kept up, and there are no facilities whatever for coaling.

Tindila island is half a mile long north and south, and 2 cables wide ; the northern part is rocky and has a clump of trees on it 250 feet above the sea ; the southern part ends in a wide beach of white sand—the observation spot of H.M.S. *Flying Fish.* A reef extends from it 4 cables to the westward. The channel between Tindila and

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* *See* plan of anchorages between Borneo and New Guinea ; No. 930. Talisse road ; scale, $m = 1{\cdot}45$ inches.

Talisse is 4 cables wide, 15 fathoms deep, and clear of all danger. The channel between Tindila and Ganga is only fit for boats.

Ganga island is about 1½ miles long and half-a-mile wide, rocky and wooded, with a clump of trees 230 feet above the sea on the southern part. The eastern side is steep-to, but the southern and western are fringed by a reef, while the southern extreme is surrounded by a bank which slopes gently from 4 to 10 fathoms depth. It is advisable to give a wide berth to this point, as the flood stream to the eastward sets directly on to it, and then branches to the northward and westward.

Lihaga, a small wooded islet to the westward of Ganga, is 109 feet high, and fringed by a narrow reef steep-to on all sides but the northern, from which shoal-water extends to 2 cables. The channel between Lihaga and the nearest point of the Likupang shore is 1¾ miles wide.

BANKA STRAIT, or LIKUPANG STRAIT, 12 miles long from North Cape to Cape Coffin, presents no difficulties: a straight course through from one entrance point to the other will pass north of Korrier rock, which has 15 feet over it, and which is the only danger for vessels under 20 feet draught, while vessels of greater draught may pass through in not less than 8 fathoms by following the directions given further on. The tide sets fairly through the channel at the rate of 2 to 3 knots at springs.

Coast.—North cape is rocky and thickly wooded to the water's edge, the tops of the trees being about 100 feet above the sea. The land slopes gently upwards from the point to a hill 825 feet high, one mile to the southward; a similar height is found to follow the direction of the north coast at the same distance from the shore. The point is fringed by a coral reef not more than 40 yards wide and very steep-to, and on its eastern side there is a beach of white coral.

On the western side of the point a creek runs in to the southward for two miles, and from there the coast trends S.W. for 15 miles to point Piso, the northern point of Manado bay; the shore throughout this distance is low and covered by mangroves to the water's edge, and broken by several creeks where there are fishing villages. This coast was not surveyed by the *Flying Fish*, but she passed along it and found the chart generally correct.

Tanjong Bohoi, situated about 2½ miles S.E. by E. ½ E. from the northern extremity of North cape, is a low rounded point with trees 100 feet high like North cape, and fringed likewise by a reef 40 yards wide ; at high water the outer trees are surrounded by water. At one mile W.N.W. of Tanjong Bohoi is the entrance to a circular bay, half a mile in diameter and lined with coral, with a depth of 5 fathoms in the middle.

Likupang road.*—From Tanjong Bohoi, the coast trends S.S.W. for 2¾ miles, and then takes an E. by S. direction for 8 miles, forming a bay, the western part of which contains two low islands and several shoals and reefs ; the shore is clothed with mangroves and fringed with coral.

Likupang town, at the mouth of the river of the same name, is controlled by a Dutch *posthouder*, and is in communication with Manado by a good road. The river is very shallow, and at low water boats cannot approach within a quarter of a mile of the beach. At one mile N.E. by E. of the river there is a point with a single tree on the reef, and one mile further east a point formed by trees reaching out to high-water mark ; the shore here is fringed by coral, and shelving. At 1½ miles east of this last point there is a pyramidal black rock, 18 feet high, connected at low water with a steep cliffy point about 300 feet high.

Anchorage.—The best anchorage off Likupang is in 7 to 9 fathoms, sand, with Likupang flag-staff S.W. 1¼ miles, and Tanjong Bohoi N.W. ¼ W. ; small vessels can anchor close in, but care must be taken not to shut in the 18-foot rock by the east point of the bay, as the ground inside is very foul. The anchorage is well sheltered during the S.E. monsoon, and free from the swell that is felt at Talisse anchorage in that season.

Supplies are scarce, but with a day's notice fowls, vegetables, and, generally, a bullock can be procured ; the water in the river is very good. There is postal communication twice a week to Manado, overland.

Cape Coffin is a bold point with large boulders off it, and a narrow fringe of coral which can be passed with safety at a quarter of a mile's distance ; there is generally a tide-race off the point. From the cape, the land rises abruptly to high table-land, 1,016 feet high, a mile long and thickly wooded, easily distinguished from all sides by its square box-like aspect. The point, 1½ miles to the westward of the north point of cape Coffin, is steep and cliffy, about 200 feet high, and surrounded by huge boulders extending seawards about one cable ; the water is shoal about 2 cables from this point.

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* *See* plan of anchorages between Borneo and New Guinea ; No. 930. Likupang road ; scale, $m = 2\cdot9$ inches.

Shoals in Banka strait.—These are all of light colour, and can be seen in clear weather at half a mile. (i.) Korrier rock is of white coral, covered by 2¾ fathoms least water, and is generally indicated by tide ripplings; the shoal part is a quarter of a mile long E.N.E. and W.S.W. and is very flat; from it Likupang flagstaff bears S. 41° W., Ganga summit N. 32° W., and the northern extreme of cape Coffin S. 80° E. The shoal is steep-to on its east and south-east sides, and shelves gradually to the northward and westward; on its west side are lumps of mushroom coral: (ii.) A shoal reported to have only 3¾ fathoms on it, but on which the *Flying Fish* found 5½ fathoms least water, lies with cape Coffin S. 57° E. Likupang flagstaff S. 40° W., and North cape N. 81° W.: (iii.) A shoal 1¾ miles long N. by E. and S. by W. and three quarters of a mile wide at its north part, with a general depth of 7 to 9 fathoms and 5½ fathoms on the shoalest part, from which cape Coffin bears S. 51° E., Likupang flagstaff S. 32° W. and North cape N. 89° W.: (iv.) A shoal 3½ cables long N.N.E. and S.S.W. and 2 cables wide, with least depth 4½ fathoms, lies with cape Coffin S. 68° E., Likupang flagstaff S. 15° W., and North cape N. 76° W.: (v.) A shoal 2 cables long N.W. and S.E., and one cable wide, with 2¼ fathoms least depth, lies with the north point of cape Coffin S. 84° E., Likupang flagstaff S. 8° E., and Tanjong Bohoi N. 51° W.

Tides.—The flood stream runs fair through the strait between cape Coffin and Banka island at the rate of 2 to 3 knots at springs. It divides to the south-east of Ganga island, part continuing to west, turning to N.W. and N. after passing North cape; the remainder turns to the northward, running to the north-west through the passages between Ganga Tindila and Talisse, and to the north between Talisse and Banka. The flood-stream on the west side of Talisse runs due north, and, meeting the stream from between Talisse and Banka, forms a tide-rip which is met with 3 miles to the north-west of the north point of Talisse. The ebb stream runs between the islands to the south-east and fair through Banka strait. Tide-rips are formed off all the salient points, and there are heavy races to the northward and north-eastward of Banka.

DIRECTIONS for BANKA STRAIT.—From the westward, North cape may be passed at a distance of a quarter of a mile; and then, a course E. ½ S., keeping the south end of Nain island just open of North cape, will lead clear of all dangers with 8 fathoms least water until the east end of Talisse and the west point of Banka are in line; a course may then be steered to pass a quarter of a mile from cape Coffin.

If intending to anchor at Likupang, after passing North cape, a S.E. course should be steered, and North cape should not be brought to the northward of N.W. by W. ½ W. until the left tangent of Talisse is in line with the right tangent of Kinabohutan, when a S.S.E. course will lead to the anchorage.

If intending to anchor at Talisse, the south point of Ganga island must be given a berth of three-quarters of a mile.

To make for Talisse anchorage by the passage between Talisse and Tindila from the north-west :—Bring the square hill of cape Coffin in the gap between Tindila and Ganga, and steer for it until the summit of Banka is in line with the hill 768 feet high (a round hill with trees on the top) bearing E. ¼ S. ; then steer for the summit of Banka on that bearing, opening the Banka summit to the northward of the hill on approaching the north point of Tindila ; when Lihaga is seen between Tindila and Ganga the anchorage off the Talisse pier may be steered for.

To pass through the channel between Banka and Kinabohutan from the northward, the west point of Banka island, (a low red cliff topped with trees) should be steered for, bearing S. until the summit of Manado Tua is in line with the south extreme of Talisse island ; a S.W. by S. course then leads through the channel in deepest water. If intending to anchor at Talisse : Manado Tua, with its breadth open south of a cleared patch on Talisse, leads over the shoal water S.E. of Kinabohutan in 8 fathoms ; when cape Coffin is open of the the right tangent of Banka, the pier at Talisse may be steered for.

To pass through Banka strait from the south-east : from cape Coffin, which may be passed at a quarter of a mile's distance, steer for the gap between Ganga and Tindila islands till the eastern extreme of Talisse and the western point of Banka are in line, and do not open them till the south tangent of Nain island is just touching North cape, bearing W. ½ W. ; then steer for North cape on that line, which will lead clear of all danger. If intending to anchor at Likupang : the point next to westward of cape Coffin should be passed at half a mile distance ; the course should then be altered to the southward till the rocks off the point are in line with cape Coffin, E. ½ N., and continued on these marks to the anchorage.

COAST.—From cape Coffin, the general direction of the coast is S. by W. ½ W., for 5 miles to the head of a bay with a river in its southern angle, and terminated to the southward by cliffs 300 feet high, pierced by curious caverns. This reach of coast consists of long steep beaches of deep volcanic sand, loose and coarse ; the favorite resorts of those singular birds, the Maleos, which, in the dry seasons deposit their eggs in the sand just above high-water mark. The country behind is hilly and wooded.

Batu Bundita is a sharp pointed rock with a white top 30 feet high.

Pulo Kalinaon is an islet 250 feet high, wooded, and joined to the main land by a reef, which also extends nearly a quarter of a mile to the southward.

Pulo Mogogimbun is a small, wooded, conical island, 163 feet high, lying one mile E. by N. from the mouth of the river above mentioned. The south side is steep and cliffy : a reef extends from its north side to about half a mile out, with five rocks showing 2 feet above high water, and several others awash.

Anchorage.—There is good anchorage in the bay west of Magogimbun island, protected from swell and southerly winds in 17 fathoms from the shore, shoaling gradually to 3 fathoms close to the beach. The *Flying Fish* anchored with Mogogimbun island bearing East, Batu Bundita N. 19° E., and a remarkable cavern S. 4° E.

Coast.—From the perforated cliffs above mentioned the coast trends in a south-easterly direction for 8 miles to the entrance of Limbé strait. The shore consists on the northern part of a long black sand beach with houses upon it ; the rest is low, rocky, and thickly wooded, rising continuously at the back to the summit of the eastern Sister. Two pillar rocks, 40 feet high, stand off the northern entrance point to Limbé strait, and a reef extends half a mile to the northward and eastward, with several rocks at its edge which do not show.

During the survey, the *Flying Fish* anchored in a small bay to the north of point Verbrandt, the north point of entrance to Limbé strait, in 17 fathoms, with Batu Kapal bearing N. 54° E., the cone 1,433 feet high south-east of Gunong Batu Angus S. 65° W., and Pillar rock off the point S. 26° E.

Volcanoes.—Mount Klobat is a very conspicuous cone standing by itself, rising to a height of 6,694 feet from a low base in the north-east extemity of Celebes island. Gunong Sodara or the two Sisters, a double peak about 8 miles E.N.E. of Klobat, is 4,300 feet high ; the eastern peak is a little lower than the western. Gunong Batu Angus, 10 miles E.N.E. of Klobat, and 3,846 feet high, has a more rounded summit than Gunong Sodara ; a crater has opened on the eastern slope of the mountain at 2 miles from the summit and 1½ miles from the sea. It is a cone of loose ashes 1,433 above the sea, of regular shape, whence a small lava stream has issued forcing its way through the forest to the sea. That it is of recent date* is quite evident, for in 1886 the ashes and lava were devoid of all vegetation save a few patches of coarse grass.

During the S.E. monsoon these hills are generally clouded after 8 a.m. to a height of 3,000 feet above sea level, but it was noticed that Klobat often remained clear while the mountains more eastward were covered.

LIMBÉ ISLAND.—Only the northern end of this island was surveyed by the *Flying Fish*; it is very narrow and shows a range of hills about 600 to 700 feet in height, well wooded, precipitous, and steep-to on both sides. The northern point terminates in sharp pinnacles with a detached rock 84 feet high, (Batu Kapal) white from bird droppings; from this rock a line of detached rocks extends 2½ cables N. by E., over which the sea breaks; the outer rocks, about 6 feet high, always show above water.

The N.E. point of the island is a wedge-shaped cliff about 200 feet high, similar to the north point. This point and Batu Kapal may be rounded in safety at half a mile distance. There is always a strong tide-race off the point.

The centre of Limbé island is about 1,500 feet high. The eastern side is high and cliffy and appeared steep-to.

Limbé strait† is narrow and somewhat intricate; it is about 12 miles long, and in the middle there are two islets encircled by reefs which cause an eddy. The channel north of the islets is said to be best, but the tides are very strong, and it is not advisable to pass through the strait in a large vessel. In the south part of Limbé strait there is good anchorage and shelter from S.E. winds when these blow into Kema road.

KEMA, which lies at the foot of mount Klobat to the S.E. of it, and 6 miles from the entrance of Limbé strait is, in fact, merely a complementary port of Manado, according to the prevalent monsoon; from April until November ships anchor off the latter place, which is quite protected from easterly and southerly gales, while from November to April the anchorage at Kema alone is used. A good road connects the two ports.

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* Mentioned by Sir Ed. Belcher in "Voyage of H.M.S. *Samarang*," 1844, as having been upheaved within a few years.

† *See* plan of anchorages between Borneo and New Guinea; No. 930. The Narrows of Limbé strait; scale, $m = 0{\cdot}95$ of an inch.

Anchorage.—There is good anchorage in the road abreast of the fort, in 10 to 12 fathoms, about a mile off shore, with mount Klobat bearing N. 36° W., and Gunong Sudara N. 28° E.; the depth from thence gradually decreasing up to the town; there is also anchorage in 5 fathoms half a mile from the shore, fair holding ground, with mount Klobat bearing N.W.* There is a pier in the centre of the beach where boats can land at high water, and the remains of a coaling jetty further to the S.W.; this is the best place for landing, as when the sea breeze sets in the swell breaks heavily on the beach.

Supplies.—Food, water, and provisions of all kinds are abundant. The government keep a very small supply of coal here, but a ship is entirely dependent on her own means for getting it off, and no large lighters are procurable.

EAST COAST.—From Kema, the coast is shown on the Dutch chart of 1888 to trend S. by W. for 13 miles to point Atep, and then S.W. by S. for another 13 miles to the Bentenan islands, a group consisting of five islands and four small islets, the largest of which is 500 feet high. The country to the southward of Kema is composed of high ranges of hills about 4 miles inland, with many tiers of densely wooded, even ridges, which descend to the sea in long tapering views; the beach is occasionally broken by small cliffs.

Current.—Between Limbé and Tifori island the current was always found setting to the northward at from one to two miles an hour during the S.E. monsoon.

Weather.—In July, August, and September in Banka strait the general direction of the wind was between S.S.E. and S.; force 2 to 3 during the day; light air and calms during the night; a few showers occurred, but there were no really wet days. There was one gale from the southward, force 4 to 6, which lasted 48 hours, and generally a squall out of Limbé strait. The weather was never very clear, except in the early morning, and the tops of the mountains were generally in the clouds. In the latter part of August, and in September, the weather became thicker, and during the latter part of September the land could seldom be seen more than a few miles. The average temperature was 82° F.

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* **Shoal.**—In 1859 Lieut. Boyer, of the Netherlands navy, discovered in Kema road a sand bank with 5 fathoms water over it, half a ship's length in extent, bearing from the mole E. ⅛ N., distant 7½ cables. The natives said that this bank had risen one fathom during the last year, 1858. This does not appear on the chart.

D.N.M., 1859, Part I., page 379. U.S. Hyd. Not., No. 8 of 1871.

NORTH COAST of CELEBES.—Manado bay.—The land to the northward of the bay is high, but terminates in a low mangrove point—cape Piso—surrounded by a peak which projects nearly three-quarters of a mile to the westward, and continues as a narrow fringe along the north shore of the bay to near the town of Manado. A reef is also said to extend along the south shore, but this is not shown on the Dutch chart. The whole bay is steep-to, the depth decreasing suddenly in a distance of 6 cables from 150 fathoms to 60, 10, and one fathom.

Although the bay itself is spacious and free from danger, it only affords a small and insecure anchorage, fully exposed to westerly winds, which sometimes prevail with great force, and send a heavy sea into the bay, especially during the months of November, December, and January; therefore during the north-westerly monsoon, from October to April, any vessel visiting this part of Celebes is obliged to anchor at Kema, on the eastern side of the peninsula, whence goods are conveyed overland to Manado. During the south-east monsoon the wind sometimes blows into the bay between 9 a.m. to 4 p.m.

Anchorage.[*]—The best position is south of the mouth of the river, with the north side of fort Amsterdam bearing S.E. by E. and the wooden jetty a little to the southward of east. The spit off the south end of the river is marked by a black buoy with staff and cage. The anchor should be dropped in not less than 30 fathoms, and as the holding ground is bad, being very steep and consisting of loose sand, a stream anchor should immediately be laid on the reef to prevent the vessel being driven off with the land wind which generally comes off at 4 p.m. There are no bollards or anchors to secure a hawser to, so a vessel is entirely dependent on her own means.

Manado is the chief town of the Minehasa district, the seat of the Residency, and one of the prettiest and cleanest towns in the east. It looks like a large garden with rows of rustic villas, the broad paths between them forming streets generally at right angles with each other. Good roads branch off in several directions towards the interior, with a succession of pretty cottages, neat gardens and thriving plantations, interspersed with wildernesses of fruit-trees. To the west and south the country is mountainous, with groups of fine volcanic peaks 6,000 or 7,000 feet high.[†]

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[*] *See* Plans of anchorages between Borneo and New Guinea; No. 930. Manado road; scale $m = 3{\cdot}6$ inches.

[†] *See* Wallace, "Malay Archipelago," page 241. Hickson's, "A Naturalist in North Celebes," p. 206

Trade.—Manado is a free port; the exports are coffee, spices, and vanilla. The Netherlands India steamers call here twice a month during the south-east monsoon, from 15th April to 15th November; during the westerly monsoon they go to Kema.

Supplies.—Beef, hogs, poultry, fruit, and vegetables are procurable. Water can be obtained from the river, but boats must go well up the stream beyond the first fork to obtain it pure. Loaded boats cannot pass the reefs at low water, and can only obtain turns between the first quarter flood and the first half of the ebb.

Tides.—It is high water, full and change, at 6h.; springs rise 6 to 8 feet.

Coast.—To the westward of Manado the coast has not been surveyed, and there is very little information about it. The chart shows the shore between point Kalapa, 15 miles S.W. of point Piso, and point Pasir Puti, 13 miles further to the S.W., to be bordered by rocks to a distance of 7 miles.

Amurang gulf.—The only information available is that Amurang in the southern part of the bay is a free port and place of call for the Netherlands India steamers from Makassar to Manado and back, once a month each way. These steamers anchor at one cable from the shore.

ISLANDS to the NORTH of MANADO.—Nain island is one mile long, north and south, and about half a mile wide; when seen from east or west it appears saddle-shaped, the northern summit being the highest, 765 feet above the sea. The island is surrounded by a coral reef which approaches close to the shore on the north side, but extends to one mile from it on the eastern side, and 1½ miles on the southern and western sides. The reef, which is very steep-to and marked by breakers and tide ripplings, encloses a lagoon containing several coral patches with deep water between them. The *Flying Fish* steamed round the reef, but could find no deep entrance. The island is cultivated, and on its eastern side is a considerable village, off which two small schooners were seen. On the eastern side, and within the lagoon, there is a wooded islet (Nain Kechil), 150 feet high.

Mantrau is a flat coral island covered with trees about 100 feet high, situated on a coral reef reported to extend 2½ miles N.W. of the island. The German vessel *Mathilde* was lost on the northwest part of this reef in 1886 in 9 feet water, with North cape bearing East, and the west extreme of Manado Tua S. ¾ W. There are several houses on piles on the reef.

Siladen island is low, and has a white sand beach on its eastern side.

Bunakin island is crescent-shaped, with a bay on the S.W. side. The summit is on the western part, and is a round-topped hill covered with brushwood. A coral reef extends about 2 miles south-west of the western point, and appears to join the fringe reef of Manado Tua.

Manado Tua is a very steep, conical, well-wooded island, apparently an old volcano ; its elevation above the sea is 2,737 feet ; it is circular, about 2 miles in diameter.

CHAPTER XI.

MOLUCCA AND GILLOLO PASSAGES TO BANDA ISLES.

Variation 1° 50′ East in 1890.

The MOLUCCA PASSAGE,* included between the north-east coast of Celebes and Gillolo islands, is the most direct, and is the regular steam passage between the Celebes and Arafura seas. It is sometimes used by sailing vessels homeward bound from China, and after September with advantage, but it is a tedious passage to beat through as the currents set with the wind at the rate of 16 to 24 miles a day.

When it is difficult to get to the southward in the Molucca channel, dull sailing vessels might try to do so by keeping near the west coast of Gillolo and passing through Patientie strait, between Gilolo and Batian islands. Vessels working to the northward would find it better to work up under the coast of Celebes.

Mayo island is about $3\frac{1}{2}$ miles long, east and west, and rises gradually from the shore to a round-backed summit, 1,280 feet high, in latitude 1° 19′ N., longitude 126° 22′ E. It is well wooded, with several valleys, but is not inhabited. There is said to be anchorage on both the north and south sides of the island sheltered from the monsoons.

Tifori island is 2 miles long in an east and west direction, and $1\frac{1}{2}$ miles broad. On its north-west end is a saddle peak 530 feet high, the eastern and highest summit being in latitude 1° 1′ N., longitude 126° 8′ E. About one cable's length off the north-west point of the island is a small islet connected with the mainland by a reef enclosing a lagoon with an islet in it on which observations for position were made by H.M.S. *Flying Fish* in 1885. Temporary anchorage was found in 22 fathoms on the edge of the reef with the summit of Tifori bearing S.S.W. $\frac{1}{4}$ W., and the summit of North island, east. The tide setting from point to point swung the ship in all directions, but not violently. On the eastern side of the island thère is a bay in which, according to the statement of the Malays at Ternate, whose proas frequently take refuge in it, there is a depth of 20 or 33 fathoms, with a ridge of coral across its entrance upon which there is from one to 3 fathoms.

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* *See* Admiralty charts, Celebes Sea, Eastern Part, No. 2575. scale, $m = 0{\cdot}1$ of an inch ; Philippine islands and adjacent seas, No. 943 ; scale, $d = 2{\cdot}8$ inches ; and Eastern Archipelago Eastern Portion, Nos. 942a, 942b, $d = 2{\cdot}75$ inches.

Between Mayo and Tifori islands, a distance of 21 miles, there are no dangers.

Currents.—During the south-east monsoon the current sets to the north, running stronger to the westward of the islands than to the eastward of them. During the west monsoon the current sets to the south, but is stronger to the eastward of the islands than to the westward of them.*

GILLOLO ISLAND.—This island is called by the natives Halmaheira (said to signify in native dialect, mainland), Gillolo being the name of a portion of it, with the inhabitants of which the Dutch first had intercourse. The interior is peopled principally by tribes of a Papuan type, but the Malays have made numerous settlements on the coast. The north and south parts of the island acknowledge the authority of the Sultan of Ternate, and the middle part and the eastern peninsulas that of the Sultan of Tidore. Both these chiefs are Malays, and the Dutch claim jurisdiction over both.

This island, though the least important, is by far the largest of the Moluccas, and in general outline is very similar to Celebes, consisting, like it, of four long and narrow limbs, with deep intervening gulfs. It lies to the extreme north of the whole group of islands, and has a length of about 200 miles from north to south ; its width across the centre is about 40 miles, beyond which the two central arms project another 50 miles to the north-east and south-west.

The northern peninsula is mainly filled up by two lofty mountain ranges, between which lies an extensive, undulating plain, well cultivated with rice and extending almost from coast to coast. This plain, which is the most populous part of Gillolo, is known by the name of Galela from a town on the east coast. The river Tiabo, which comes from the south through the plain, enters Galela bay on the eastern side. Of the remainder of the island there is little information.

WEST COAST of GILLOLO.—From **Bisoa point,** the north point of the island, the coast runs S.S.W. for about 53 miles to Petano point, and is high and steep-to. The Salengading islands, off the north-west point are a group of four islands surrounded by reefs ; there is a channel 4½ miles wide and clear of danger between the southern island and the coast. The islands Tago Sungi and Sidun 6 miles north of Petano are connected with the coast by a reef.

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* Molukscho Archipel., p. 321.

Close to Petano point there are several small islets, and south of the point, according to the *Moluksche Archipel.*, there is a bay extending to the south-east, south of which is the west point of Gillolo island with a high mountain, Mount Sidanoli, on it, and the island Talabu or Damar near it. The native town of Gillolo is on the extremity of the point. This description, though agreeing with former charts, is not in accordance with the Dutch chart of 1878. The following remarks are by officers of the *Challenger* which passed north from Ternate in 1874. "The point on the coast of Gillolo opposite Hieri island was wrongly placed on the chart; it lies N.E. ¾ N., 8 miles from the peak of Hieri island. Just over this point in lat. 1° 2½′ N., long. 127° 24′ E., is a hill 1,050 feet high, and N. by E. 3 miles from this hill is a remarkable sharp peak 3,450 feet high in lat. 1° 5′ N., long. 127° 25′ E. About 8 miles north of this mountain is a flat-topped hill with four knobs on it, in lat. 1° 13′ N., long. 127° 25′ E. The coast of Gillolo did not appear to extend west of the meridian of 127° 23′ E."*

Dodinga bay is separated from Kayu bay, on the east coast by a narrow isthmus, on which is situated the town of Dodinga. The northern side of the bay is bordered by reefs, which dry at low water, and on which are several islets. Other reefs have been reported by coasters to exist on this side and in the bay of Gillolo or Sidanoli, north of Dodinga bay; this locality should therefore be approached with caution.

Detached shoals.—On the Dutch chart of 1878 two detached shoals are shown N.N.W. 4 miles, and W.S.W. 2½ miles respectively from the north point of Dodinga bay; and six shoals are shown in Dodinga bay, most of them nearly in a line between the head of the bay and the north-east point of Tidore island. The positions of these last shoals appear to be very uncertain.

The coast south of Dodinga bay for 10 miles, as far as Akelema point, is high, steep, and clean, and can be approached to half a mile's distance; the only known dangers off it are Pasir Rajah sand banks. Akelema point is low. Anchorage may be had off the village of Kalam, south of the point, in 25 to 30 fathoms; good water can be obtained from a small river to the southward of the village; deer, pigs, poultry, and firewood are procurable.

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* *Challenger* Report, Vol. I., p. 604.

From Akelema point to the southward, as far as Mayedi (Mandi), the coast must not be closely approached, as it is bordered by rocky islets and reefs, especially near Taona, and thence to the point west of Gieta. There is anchorage in Payahe road in 8 to 15 fathoms.* From Mayedi to Dieke point the coast is safe.

Pasir Rajah consists of two small sand-banks, dry at low water, which lie from 2 to 3 miles east of Akelema point, and about 5 miles E. by N. of the north point of Mareh island. These rocks, which are in the fairway from Ternate to Patientie strait, may be readily seen by their white colour during daylight, and may easily be avoided at night by keeping the Gillolo coast aboard.

Bank.—A small sand-bank lies 3½ miles south of Joji islet, west of Gieta bay, and 10 miles east of the south-east point of Makyan island. Information is wanting as to the depth of water over it.

Nassau rock, having 4 feet water over it, was discovered by the *Nassau* in 1872; it is 150 feet long, and 30 feet broad, and lies 11 miles E. by N. from Miskien island, and is dangerous, being directly in the track of vessels making for Patientie strait from the northward. The west end of Mareh island, shut in with the east end of Motir island, clears it well to the westward. On the old chart of 1846 a bank was shown 2 miles to the west of Nassau rock.

PATIENTIE STRAIT, which separates Bachian and Gillolo islands, is 8 miles wide at the northern entrance, between Dieke point and Batu Sombo island, but is very much narrowed further south by the Lari islands. The best channel appears to be between the south-western Lari islet, Latau, and a small conical islet north-east of it; or between Latau islet and Ruige point in Bachian. The passage between the north-eastern island, Djalo, and the Gillolo coast is very narrow and shallow. After passing through the narrows going south the shore of either Bachian or Gillolo should be kept aboard to avoid a steep shoal lying between Hennekes point in Bachian and Steep point in Gillolo.

Patientie strait is a useful passage for vessels sailing between Ternata and Amboina in either monsoon, and vessels have been able to work through the strait by the help of the tides when unable to work to windward westward of Bachian island.

Dowora island (Ganeh) at the southern entrance of Patientie strait is tolerably high; on the east side are several islets and dangers, but the west coast is clean. The passage west of Dowora should be taken.

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* *See* Admiralty plan of Anchorages in islands of north-west part of New Guinea, No. 912, Payahe Road; scale, $m = 0·42$ of an inch.

SOUTH POINT of GILLOLO ISLAND and ISLANDS OFF IT.—**Libobo point,** the southern point of Gillolo, is low land, with a hill upon it, and a small islet, Babi, off it. Gane road, about 12 miles westward of the point, affords confined anchorage in 13 fathoms.* The channel between Libobo point and Damar island is said in the *Moluksche Archipel* to be clear of danger, though it should not be taken during the east monsoon, except with a commanding breeze, on account of the heavy swell found in it, and then only in daylight. The currents in it are very strong.†

Damar islands.—This group of islands lies to the south of cape Libobo, 4 miles distant. The large island (Damar) is intersected by low but steep hills ; and on its northern side is a large shallow bay, in which are many small flat islands, situated on a shoal bank. The west coast of Damar island should not be closely approached on account of the numerous coral reefs, and dense mangroves, which grow far into the sea.

Water may be obtained from a small well on Katinat islet, one of the Damar group. There is no water on Damar island.

Hasil island.—The *Moluksche Archipel.* states that there is a good passage between Damar and Hasil islands. It gives no information about Hasil island, nor about Five islands, nor the three Muidens, which lie west of Damar and Hasil. Gull rock is shown on the Dutch chart 7 miles west of the south point of Hasil.

Black rocks or **Fairway ledge** bears about E.N.E. 6 miles from Hasil island, and S. by E. $\frac{3}{4}$ E. from the hill over Libobo point. They are a low ridge of rocks, about two miles in extent E.N.E. and W.S.W. ; a part of which near the east end is like a small ship's hull above water. The breakers continue towards Damar beyond the rocks. They, therefore, should be carefully avoided during the night, by giving a wide berth to them, for there are no soundings to guide.

The east coast of Gillolo will be described hereafter with Gillolo passage.

ISLANDS WEST of GILLOLO.—TERNATE ISLAND, which lies about 8 miles from the centre of the west coast of Gillolo, is of small extent, being composed almost exclusively of a conical volcano 5,600 feet in height. This volcano has been in a state of constant activity for more than 200 years, during which period there have been no less than fourteen eruptions; the last occurred in 1840, and was attended by great loss of property.

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* *See* Admiralty plan of Anchorages, No. 912, Gane road ; scale *m* = 1·6 inches.

† In Findlay, 3rd edition, p. 872, this passage is said to be too narrow for ships

The shores of the island appear to be steep-to, and with no dangers beyond a few reefs extending out from a quarter to half a mile.

The town of Ternate lies on the east coast, and is beautifully situated upon the shore at the foot of the mountain. It is the seat of the Dutch Resident, and also that of the Sultan. It was declared a free port in 1854. The population was estimated in 1881 at 9,000 inhabitants, 285 of whom were Europeans.

Anchorage.*—The best anchorage in Ternate road is in 13 to 15 fathoms, about 3 cables, distance from the shore, with the flagstaff of fort Orange bearing from N.N.W. to N.W. by N. and the summit of Maitara island S.S.W. Vessels making more than a temporary stay should moor, as the bank is very steep, the holding ground bad, and the tide streams strong.

Piers.—Three piers extend from the island to the edge of the reef, which is composed of sand and coral. The northern pier is used as a landing place, the middle pier is for the shipment of merchandise, and the southern is the coaling pier. These piers are lightly built, and would be easily destroyed by a ship pressing against them. There is a depth of 5 fathoms at the outer end of the coaling pier; and small anchors are buried on the land, to which hawsers may be secured, but, from the frailty of the pier, anchors off the bow and quarter are necessary.†

Supplies.—Provisions are abundant and cheap; fruit of all kinds is plentiful during the season, and good drinking water is obtainable from a well situated close to the coal sheds, and at about 230 yards distance from the shore. The coin in circulation is the Dutch dollar of 4*s*. 2*d*., and the guilder of 1*s*. 8*d*.

Coal.—Two large coal sheds stand upon the shore abreast the coal wharf; they are capable of holding 1,000 or 1,500 tons, but at the time of the *Challenger's* visit in 1874, a small quantity only was in stock. The price of English coal, free on board, is 64*s*. 3*d*., and of native coal 65*s*. a ton.

Vessels of the Netherlands India Steamship Company touch once a month.

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* *See* Admiralty plan: Anchorages between Borneo and New Guinea, No. 930, channel and road of Ternate; scale, $m = 0{\cdot}65$ of an inch.

† In making fast to the shore, it is usual to keep the ship's head to the northward, letting go the starboard bower anchor, and having a kedge on the starboard quarter; with bow and quarter hawsers from the port side of the ship, to a gun and anchor on the shore.—Commander Dawson, H.M.S. *Egeria*, 1890.

Tides.—It is high water, full and change, at Ternate, deduced from one day's observation by the *Challenger*, at 5h. 10m.; springs rise about 4 feet. According to the *Molukssche Archipel.* it is high water, full and change, at 7h., and springs range from 5 to 6 feet.

Weather.—From a register kept by the surgeon of the Dutch settlement at Ternate, extending over a period of 8 years, from 1860 to 1867 inclusive, it was deduced that the north-east monsoon blows through January, February, and March, the wind varying from north-east to north-west After a month of variable winds, the south-west monsoon commences in May and ends in October, its direction being from south-east to south-west. During November and December the winds are again variable.

Rain fell on 216 days of each year, or 18 days per month; the average fall during the north-east monsoon being rather less than during the south-west monsoon.

The mean temperature for each of the above 8 years was 80·7°.

On comparing the records of the weather at Ternate with those at Amboina and stations eastward, it would appear that, during the periods of their greatest strength, the north-east monsoon passing through the Molucca passage turns eastward and becomes the north-west monsoon in the Banda and Arafura seas; and that the south-east monsoon blowing through the Arafura and Banda seas, bends into the Molucca passage, and joins the south-west monsoon in the Pacific.

Hieri island, lying to the northward of Ternate, is irregular in shape, about 1¾ miles in diameter, and rises to a conical peak, 2,200 feet high. There is a rock off the north point of Hieri, and to the north-west of the island a small islet, both close to the shore.

Ternate channel,* between Ternate and Maitara, should not be taken by a sailing vessel except with a commanding breeze, on account of the eddies. The flood-stream in it, coming from the north-eastward, forms numerous tide-rips and eddies, which give the appearance of broken water over a sunken reef. If unable to make way in it, a vessel might anchor on the south shore of Ternate in 13 fathoms, shells, with Maitara peak bearing S. ½ E.; there is no anchorage off Maitara island.

Maitara island is about 600 feet high, crater-topped, and well cultivated; it is surrounded by a reef which extends furthest out towards the west and north.

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* *See* Admiralty plan, Anchorages between Borneo and New Guinea, No. 930; scale, m = 0·65 of an inch.

Tidore is a somewhat larger island than Ternate, from which it is separated by a passage under 2 miles in width. It is of volcanic formation, the centre peak rising from a mass of low rugged hills to a height of 6,000 feet. There has been no eruption within the memory of man. The soil is remarkably fertile, and the island is well cultivated, the natives being more industrious and inclined to agriculture than those of Ternate. The population in 1881 amounted to 8,157.

The chief town is Saosio, on the east coast. In front of the town there is a reef of rocks and stones, partly natural and partly artificial. There is anchorage off the town in 30 fathoms, sand. A Dutch *Controlleur* is established at Saosio.

Mareh island lies 3 miles south of Tidore; there is anchorage near its south point, sheltered from the north-east. The island received the name of Potbakers from the Dutch, on account of the potter's earth found on the north-east point, near which is a hill 617 feet high. The island has two peaked hills on it. The chart gives an elevation of 1,160 feet for the island.

Motir island, 4 miles south of Mareh, is another volcanic cone, 2,800 feet high; it is stated in the *Molluksche Archipel.* to be steep on all sides except the south-east, from which a small reef projects. The east coast is covered with plantations and gardens, and forests to the summits of the mountains. In January 1874 the British ship *Abyssinia* was wrecked on a coral reef, stated to be of recent growth and to be situated three-quarters of a mile from the N.N.W. point of the island.

Makyan island, 5 miles south of Motir, was in the year 1861 devastated by a volcanic eruption, and the population destroyed or obliged to leave the island. Notwithstanding this, Dr. Bernstein, in his last visits in 1862–64, found even the ground which had been most injured again covered by luxuriant vegetation. There is anchorage off Powati on the east side in 30 fathoms, about one cable's distance from the shore, with the highest peak of the island bearing W.S.W.*

Miskien is a small island lying 8 miles to the southward of Makyan island.

Kayoa island, close to the south of Miskien, was until lately hardly known even by name. The largest village on the island is Gunripingi, on the north side of a bay.

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* *See* Admiralty plan of Anchorages in islands off north-west part of New Guinea, No. 912. Powati anchorage; scale, $m = 2{\cdot}15$ inches.

Lolun island, S.S.W. of Kayoa, is shown on the chart to be joined to that island by a reef. Miskien, Kayao, and Lolun are lower than the islands to the north of them.

Goaritji islands, south-west of Makyan, are a group of five small wooded islets of moderate height, and several bare rocks. The westernmost is shown on the Dutch chart of 1878 as lying in lat. 0° 8′ N., and long. 127° 4′ E. By daylight they are not dangerous, as most of them are visible; by night it is well to give them a wide berth, as the set of the currents in their vicinity is uncertain.

Wolf rock is nearly level with the surface, the sea breaking over it, when it becomes visible in the hollow of the wave. It was examined in 1846 by Lieut. de Brauw, who obtained 16 fathoms depth at 1½ cables distance to the southward of it, and 13 fathoms at one cable to the northward; no other shoal was found in the vicinity. From it the centre of Ternate bore N.E. ¾ N., the centre of Makyan E. by N., and the most northerly of the Goaritji islets (Gafi) E. ½ S. The peaks of Ternate and Makyan were hidden by clouds at the time.

Tameti island, of the Dutch chart of 1878, is called Little Tawali in the *Moluksche Archipel.*

Lata Lata islands.—Captain Forrest, in 1775, anchored in Malaleo cove, on the north-west side of Tapi island, in 4 fathoms, close to the shore. The depth in the middle of the cove is 12 fathoms; the eastern entrance point is bordered by a reef. The strait between Tapi and Lata Lata is only 40 yards wide in places.

The following remarks are taken from the *Challenger* Report.* "The islands of Mandioli, Sao, Tawali, and Tapi, and the summit of Mount Laboa, on Bachian island, are correct relatively to each other on the Admiralty chart of the Eastern Archipelago, eastern portion, but they all require to be shifted S. 75° E. (true) 3 miles to make them agree with the positions obtained by the *Challenger* (depending on the longitude of Amboina). Mount Laboa is a remarkable flat-topped mountain, 7,150 feet high, in lat. 0° 44′ 30″ S., long. 127° 31′ 45″ E. Mandioli island is high and flat-topped, but has a peak rising above the surrounding hills, 2,650 feet high, in lat. 0° 20′ S., long. 127° 10′ E. The highest peak of Tapi, 1,300 feet above the level of the sea, is in lat. 0° 15′ S., long. 127° 4′ E. Off the south and west extremities of Tapi are two small islets, about 200 feet high, and 3 miles to the northward of its north point, in lat. 0° 11′ S., long. 127° 1′ E., are three small rocks 130 feet high, and close together."

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* Narrative of the Cruise, Vol. II., page 593.

BACHIAN ISLAND, the largest and most southern of the true Moluccas, is about 50 miles long north-west and south-east with a mean width of 20 miles. The island is generally mountainous, especially towards the north and south; the central isthmus, which connects these two portions, being of a much lower elevation. The highest peak is that of Laboa. There are no volcanoes, but there are sulphurous springs of a high temperature, and the island is subject to occasional shocks of earthquake. The interior is uninhabited, but the coast districts are peopled by Ternate and Celebes Malays, and by wandering tribes of Gillolo aborigines. In 1881 the population of Bachian, Obi, and the adjacent islands was given as 25,000.

Only a small part of the town of Bachian is under the direct authority of the Dutch *Controleur*, the remainder of the island, together with the islands off the west coast, being under the jurisdiction of the native sultan.

Bachian town,[*] the seat of the *Controleur* and residence of the Sultan, is situated at the head of a deep and wide bay, about the middle of the west coast. The trade is principally in the hands of the *Bachian Trading Company*, which has been established some years, and has large plantations of coffee, cacao, nutmegs, and tobacco; gum copal and dammar, of the value of £6,700, was exported by the company in 1885. Vessels of the N.T.S.S. Co. call once a month.

The Anchorage is off the east end of the town in 7 fathoms, good holding ground; with easterly winds there is a considerable swell.

Coal.—Four miles southward of the town of Bachian there is an inlet which the Dutch company have utilised as a coaling station, and where the *Marchesa* in 1884 obtained good coal from alongside the pier. The station is named Pernambuan.

The coal mines lie up the valley of a small but rapid stream; the coal is said to vary in quality; when tried on board the Dutch man-of-war *Etna* it gave good results.

Herberg strait, it is said, may be safely navigated by steam vessels under 1,000 tons, but for a larger vessel would be dangerous, as there is a sharp turn near the narrows, which is only about 60 yards wide. This passage is useful for small steamers bound northward in the north-west monsoon, which blows strong from N.N.W., outside Tawali island.

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[*] *See* Admiralty plan of anchorages:—No. 912, Batian Road; scale, $m = 1{\cdot}83$ inches.

Bachian strait, between Mandioli island and the south-west point of Bachian, is about 5 miles wide. The currents in the strait are said to be very strong and irregular, especially in the northern part.

Great Tawali.—On the west side of this island there is a small bay, Bissori (possibly the Imbu Imbu of the Dutch chart), with a small island on the north side, and a reef projecting from the south point. A depth of 20 to 16 fathoms will be found with the little island bearing North, and good anchorage within the bay in 12 fathoms. Water can be obtained here. The passage between Tawali and Lata Lata is said to be free from danger. The brig *Nautilus* worked through from south to north in 1839. There are several islands off the south-east part of Tawali, and between Tawali and Mandioli, on the east side of one of them, Babi, there is anchorage in 13 fathoms.

Gamyaka reef.—The chart shows a long reef to the west of Mandioli, with a bank named Gamyaka on the middle of it.

Bahia reef.—In 1858 the ship *Bahia* was reported to have struck and dragged heavily over a reef placed by her in about lat. 1° 10′ S., long. 126° 50′ E. H.M.S. *Flying Fish*, in Sept. 1885, searched the site during three days, and obtained soundings of 1,300 and 1,064 fathoms, but saw no signs of a reef. The Dutch steamers running to Ternate have seen no signs of the reef.

Currents.—During the search for the above the *Flying Fish* experienced a constant current to the northward, the wind being light from the southward all the time. The *Moluksche Archipel* states that there is always a current to the southward on this coast during the north-west monsoon.

OBI MAJOR or **OMBIRÀ,** lies on the north side of Pitt's passage. It is about 30 miles long, east and west, and 15 miles wide. It is lofty, the highest part being about 5,000 feet high. Over the north-west point of the island is a remarkable bluff, with a knob-like summit, probably a clump of trees, higher than the surrounding forest; the knob is in lat. 1° 24′ S., long. 127° 24′ E. Five miles southward of this bluff is a projecting point which looks like an island From the western point a reef runs out. Obi Major is but scantily populated; the chief produce is sago. It is surrounded by several smaller islands, of which Gomono, on the south side, is the most conspicuous from Pitt's passage; this last is 850 feet high, round backed, and its centre is in lat. 1° 50′ S., long. 127° 38′ E.

Sophia reef lies midway between the north point of Gomono and Rocky point on the west point of Obi Major, which should not be approached within 2 miles.

Obi Lato is 6 miles in diameter, and attains an elevation of about 2,400 feet; upon it are three or four sharp, well defined peaks, of nearly equal height, the highest point being in lat. 1° 25″ S., long. 127° 18′ E. Its centre is 8 miles N.N.W. of Rocky point. The *Marchesa* anchored in a little bay on the north-east of the island in 4 fathoms, well protected from all winds except easterly.

Tapa island, off the N.W. point of Obi Major is 10 miles long E.S.E. and W.N.W.; it is about 1,000 feet high, and rises in a single round-backed hill, its summit being in lat. 1° 12′ S., long. 127° 23′ E.

Numerous tide rips were passed through westward of the Obi islands by the *Challenger*.

Loyang island on the east side of Ombira is 9 miles long N.N.E. and S.S.W. and of moderate height, well wooded, stretching with a remarkably even slope that forms its northern extremity. The channel inside it is very narrow, and subject to calms, owing to the adjacent high land, and is therefore not recommended for ships. A small island, Long island, lies off the north end of Loyang.

Courier rock, discovered by the *Koerier* in 1843, is about three-quarters of a mile in length and very narrow, with one fathom water over it; it lies on the following bearings: the summit of Tapa island over the north point of Bisa island N. 82° W.; a high mountain in Ombira S. 66° W., and the north-east point of Ombira S. 35° E.

The SULA ISLANDS are four islands of considerable size, lying eastward of the central peninsula of Celebes, to which they belong both geographically and zoologically, though under the government of the sultan of Ternate. The three northern islands form a chain extending east and west about 135 miles, and are high, bold islands, thinly populated.

Taliabu, the westernmost and largest, is very little known. Greyhound strait, between the west coast of Taliabu and the chain of islands and reefs which lie off the eastern coast of Celebes, is out of the scope of this work.

Mangola, the middle island, is generally high, especially at the north-west end, where it is lofty and rugged; there are three native villages on the island. The channel between Taliabu and Mangola is said to be impracticable for vessels. A small island, Crab island, surrounded by reefs, lies near the north-west point of Taliabu.*

Lisamatula, the easternmost island, is uninhabited; the sides are steep and thickly wooded; the top presents an even rounded appearance, the highest part being from 1,100 to 1,200 feet high. The island is separated from Mangola by a narrow channel. At the eastern extremity there is an inlet penetrating about a mile, divided into two arms by a low tongue of sand covered by bushes and bordered by a reef of a cable's breadth; the depth of water at the edge of the reef falls rapidly to 35 fathoms. The *Flying Fish* anchored off this reef while fixing the position of the eastern point of the island by observations, but no safe anchorage was found, and by the appearance of the shore a heavy sea must sometimes set in.

The eastern point of Lisamatula consists of Tertiary fossiliferous limestone, somewhat underworn by the action of the sea; it is surmounted by a hill 340 feet high, and was determined to be in lat. 1° 48½′ S., long. 126° 28¾′ E. There are no dangers off it; the bottom slopes gradually to 40 fathoms depth at a distance of one mile, and 135 fathoms at 2 miles. A very strong tide-race makes off the point, the flood-tide setting to the south, the ebb to the north. A small saddle-topped islet lies S.S.W. of the point. On the north-east side of the island, the white cliffs laid bare by land-slips are conspicuous to a considerable distance.

Sula Besi, the southernmost island, is of no mean height, being visible at a distonce of 40 miles, and presenting a level appearance when thus seen in the distance. The island is well inhabited and well cultivated, producing wax, honey, and rice. There is a village near the south-east end named Ipa, where the chief resides. On the north-east coast there is a small creek called Sannana bay†, about 2½ cables wide in the middle where is good anchorage in 10 fathoms. The entrance is nearly closed by reefs from both sides, which leave only a narrow passage half a cable wide; the little fort at the head of the bay bearing W. by N. ½ W. will lead through this passage.

Channel between Sula Besi and Mangola.—The northern part of Sula Besi is bordered by a reef, extending 2½ miles to the eastward, and leaving a channel about three miles wide between it and the Mangola shore, which is bold, and affords anchorage off it in

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* It is here that Drake is supposed to have repaired his ships in 1579, before crossing the Indian ocean.

† *See* Admiralty chart:—Plans of anchorages between Borneo and New Guinea, No. 930: Sannana bay; scale, *m* = 8·0 inches.

30 fathoms. The chart shows a patch of 4 fathoms nearly in the middle of the narrowest part of the channel. Currents run 3 to 4 knots in the channel, and the eddy winds from the high land make it inadvisable for a sailing vessel to take this passage.

GILLOLO PASSAGE.—The Gillolo passage formed between the islands Gillolo and Waigiu is separated into two channels by Gebi island which lies across nearly in the middle. The western channel between Gillolo and Gebi is that generally known by the name of Gillolo passage, and is preferable to the eastern passage. The channels between the islands leading from Pitt passage into Gillolo passage are all held to be safe. That between Gasi and Kikik, being wide, is generally preferred in the north-west monsoon ; for the other wide channel between Pisang island and the Bu islands is at that season too far to leeward, but it may be adopted by ships coming from the northward during the south-east monsoon.

Caution.—The longitudes of the various points in Gillolo passage must be received with caution. By observations on board the *Vettor Pisani*, when passing through in 1872, many of the salient points were found to be from 3′ to 6′ west of their charted positions.*

Morti island,† lying 13 miles off the north-east point of Gillolo, is 43 miles long, north and south, and 16 to 18 miles wide according to the Dutch chart. It slopes down from a high table land to a point which forms the north cape. The northern coast is skirted by a reef extending one or two miles out, having no soundings close-to, with some small islands adjoining.

Riao island lies off the western side of Morti, separated from it by a small strait. Between the north-east part of Riao and Morti there is said to be anchorage, and that fresh water and game are obtainable, but the island is uninhabited, and only rarely visited from Gillolo.

EAST COAST of GILLOLO.—Galela bay.—Galela village stands at the head of this bay about 3 miles south of the mouth of the river Tiabo ; the land at the head of the bay is low, but behind the village are two hills joined by a little ridge ; the higher of the two, mount Tarakan, has an elevation of 918 feet. The Dutch government formerly had a settlement here. There is anchorage in 22 fathoms very close to the shore with the point east of the anchorage about east, and the point north of it about N. ½ E.; it is necessary to lay out a hawser to the shore.

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* Cosmos di Guido Cora, Vol. IV., 1877, p. 171.

† *See* Admiralty chart :—Philippine islands and adjacent seas, No. 943 ; scale, $d =$ 2·8 inches.

Loari point, the south-east point of Galela bay, is a sloping spur of mount Mamudia, an old volcano 2,985 feet high, wooded to the summit; the point is bordered by a reef.

Tabello islands off Loari point are flat, and skirted with mangroves and coco-nut trees. In the interior there are thickly populated villages, the inhabitants of which live by fishing and cultivating rice. The largest and most populous island is Talono.

The coast is flat as far south as Mauvea point (not named on chart) off which there is anchorage protected by the little island Miti and Magalisso. From here to Batikara point the coast is rocky and unapproachable; inland there are steep hills about 200 feet high.

Kayu bay, which separates the north-eastern from the northern peninsulas, does not appear to have been much explored. The town of Kayu lies on the north coast, and the river Kayu enters on the same side. The chart shows anchorage in 5 to 10 fathoms off the town of Kayu. Batikara point, the northern entrance point, has an island, Bali, off it. Lolobato point, the southern entrance point, is bordered by a reef which is shown on the chart to project to a distance of 2 miles N.W. from the point.

Cape Salawai, the northern point of the north-east peninsula, has a reef off it, projecting 2 miles to seaward by the chart. The coast between Lolobato point and cape Salawai appears to be safe with deep soundings off it.

BULI or WOSSA BAY, lying between the north-eastern and south-eastern peninsulas of Gillolo, has numerous islets and rocks scattered in it. Wayameli point, the northern point of the bay, some 25 miles from cape Salawai, has a reef off it. Gareel shoal, the position of which is doubtful, is shown on the chart on the north side of the bay, 13 miles S. by W. of Wayameli point. A sand bank extending north-west and south-east about one mile, the north part of which uncovers at low water, lies with Buli point bearing S. 87° W., Para Para islet S. 82° E., and Wayameli point N. 38° E. A depth of 42 fathoms, mud, was found one cable distant from the sand-bank. Several other banks are shown on the chart as lying off the northern and western shores to a distance of 5 miles from land.

Maba road* in the south-west part of the bay offers anchorage in 9 fathoms, mud, N.E. by N. of the flagstaff of the village, and north of the islet Maba, which is united to the coast by a reef. Good water can be obtained here.

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* *See* Admiralty plan of anchorages, No. 912, Maba road; scale, $m = 0{\cdot}32$ of an inch.

Bitjoli or Wossa road* on the south side of Wossa bay offers good anchorage in either monsoon. The village of Wossa, which stands on the shore about 14 miles west of Sandy point, the southern point of Wossa bay, was formerly occupied by a small Dutch garrison, now withdrawn. There are several islands off this part of the coast; of these, England island close to Sandy point is the largest, and the only one inhabited. Para Para, 10 miles north of Wossa, is the northernmost; these islands are all surrounded by steep reefs. The channel between England island and Otto island to the north-west is safe, with a depth in it of 23 to 17 fathoms. The channel between Otto island and Worra island, which lies 5 miles west, is reported to be safe. A shoal lies with Otto bearing S. 17° E. and Leleve island N. 73° W.

The anchorage is between Worra island and the village of Wossa on the main land in 14 fathoms; care must be taken not to bring the west point of Worra to bear eastward of N.N.E.; the Dutch chart of 1878 shows a large bank to the westward of this position. During the west monsoon it is better to lie closer under Worra island, which can be approached within 3 cables on the south side.

The Shanpi islands are said to consist of four islands and several islets surrounded by a reef, lying about 7 miles from the east coast of Gillolo near Sandy point. They extend about 8 miles north-west and south-east; the northern one is the highest, the others are mostly level and not very high. The channel between the islands and the coast is safe.

A shoal of sand and stones covered by 10 fathoms water, is situated with the easternmost of the Shanpi islands bearing S. ¾ W., distant about 10 miles, and Catherine island E. ¼ N. Old charts show a reef about 3½ miles north of this position. A depth of 20 fathoms was found 2 miles S. by W. ½ W. from the 10 fathoms shoal.

Cape Tabo, the eastern extremity of Gillolo, has a gradual slope, ending in a bluff to seaward; and when bearing N.W. by N. some white cliffs are seen near it. The land hereabout is high, and over the point a hill rises, like a quoin, with its thick end to the westward. Pulo Moar is low, flat, and woody, stretching 1 or 1½ miles out from Cape Tabo, connected with it by rocks and breakers; close to the east end of Pulo Moar there is a small islet in lat. 0° 9′ N., long. 128° 58′ E., which forms the western boundary of the passage between it and Gebi. The eastern coast of Gillolo is well inhabited in many places, with small villages fronting the sea adjacent to cape Tabo; Gimia road lies 15 miles north-west of cape Tabo* and Gam Sungi 10 miles W.N.W. of the cape on the south side of the peninsula; a coral shoal, covered by 2 fathoms water, lies near the anchorage in Gam Sungi road, with the following bearings:—East extreme of bay E. by N. ¾ N.; west extreme of bay, W. by N. ¾ N., flagstaff N.N.W. ¾ W.*

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* *See* Admiralty chart:—Plans of anchorages between Borneo and New Guinea Bitjoli or Wossa road, No. 930; scale $m = 0{\cdot}12$ of an inch.

WEDA BAY, the great bay between the south-eastern and southern peninsula of Gillolo, takes its name from a town on its western side near the head.* No useful information about it has been obtained. The east coast of the southern peninsula is reported by Dr. Bernstein to be mountainous.

Weda islands are low and wooded, and form two compact groups. The outer island of the eastern group bears about N.E. by N. from the south point of Gillolo, distant about 20 miles. The western smaller group lies W.N.W. of the outer eastern group. They seem to be safe to approach though very steep-to. The *Marchesa* tried for anchorage among them but found none.

Veldman rock, 6 miles northward of the eastern group, is of small extent with deep water close to it. The least depth of water found on it was 2 fathoms, but there might be less; from near the shallow part the easternmost Weda island bears S. by E. ½ E., and the westernmost W. by S. ½ S.

The south point of Gillolo, and the islands and reefs off it have been described, page 394.

DANGERS NORTH of GILLOLO PASSAGE.—Canton packet shoal is described as being of white sand and black rock, with the sea breaking in one place on what appeared to be a rock near the surface. From a position in 9 fathoms the south-east point of Gillolo† bore S. by W., Catherine island E.N.E., and the body of Shanpi islands S.W.

Recovery rock is described as a round islet with shrubs on it, lying 10 miles S.W. by W. from the Catherine islands.

Catherine islands are three small low islands near each other, bearing N.N.E. ½ E. about 33 miles from Moar island. They are described as lying W. by N. and E. by S. about 1½ miles long, low, and steep on the south side, except near the east end where there is a small sandy cove.*

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* *See* Admiralty plan of anchorages, No. 912. Gimia road; scale, $m = 1{\cdot}35$ inches. Gam Sungi road; scale, $m = 1{\cdot}35$ inches. Weda road; scale, $m = 1{\cdot}8$ inches.

† Probably the hill over the point, distant 26 miles.

Ardassier is a rocky islet, reported in 1808 as lying north-west of the Catherine islands, distant 6 miles.

Erbe island was reported (1851) by Captain von Erbe, of the Netherlands bark *Albrecht Beijling*, to be a small island with a rock about 1¾ miles distant from its north-west side. From observations agreeing with bearings taken of Cape Tabo the island was placed in lat. 0° 43½′ N., long. 129° 15′ E., the Catherine islands being seen at the same time.

Observations taken on board the *Vettor Pisani* in 1872 placed Erbe or Albrecht island in lat. 0° 43′ 45″ N., long. 129° 9′ 12″ E. The Catherine islands were seen at the time, but Ardassier islet was not seen.

In January 1886 the brig *Albert Reimann* passed over the charted position of Erbe island, the vessel's position being fixed by bearings of Catherine islands; the weather was clear and the sea smooth, but no trace of an island could be seen in the locality assigned to Erbe island. Also in December 1886 the ship *Cape St. Vincent* passed within 4 miles of the charted position of Erbe island; the weather was clear, but no island could be seen in the direction of Erbe island.

It is probable, therefore, that Erbe island is identical with Ardassier islet, which must in that case lie N.E. of Catherine islands.

Aurora bank was placed by the *Aurora* in lat. 0° 40′ N., long. 129° 30′ E., with the northernmost of the Catherine islands, seen from the mast-head, bearing W. ½ N. The least water obtained by that vessel on the bank was 8 fathoms, yet a whaler has stated that there is only 5 feet in some parts.

Winchester bank is reported by Captain Winchester of the *Coral Nymph*, who in December 1865 saw rocks under the ship, and sounded in 12 to 19 fathoms, the island of Siang visible from aloft bearing S.S.E.; he was of opinion, however, that there was not more than 5 or 6 fathoms when the rocks were first seen. The position is shown on the chart in lat. 0° 44′ N., long. 129° 27′ E.

Ormsby bank was first discovered by Captain Ormsby, who struck 15 fathoms with Wiang island bearing S. ½ E., and placed the north edge of the shoal in lat. 0° 46′ N. Subsequently the captain of the *Chusan* obtained 7 fathoms with Siang island bearing N.N.E. 17 miles; the bank to the north of the ship at the same time appeared to have much less water, and was very smooth. The chart shows 5 fathoms in lat. 0° 40′ N., long. 130° 02′ E., and a rock with less than 6 feet of water 8 miles S.S.W. of that position.

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* Horsburg places these islands in lat. 0° 39′ N., long. 129° 11′ E. Horsburg, Vol. II., 8th Edition, p. 612.

In 1878 the British barque *Fire Queen* obtained depths of 20 to 27 fathoms from a distance of 10 miles south-west of Ormsby bank, in a northerly direction, to abreast its northern edge.

EAST SIDE of GILLOLO PASSAGE.—Gebi island, which lies on the middle of the northern part of the passage, is about 21 miles long north-west and south-east and in general less than 4 miles wide; it is traversed by a range of hills, the highest, on the eastern side, attaining about 1,200 feet; the formation is probably sandstone, not volcanic. The northernmost part is rather low, but the south-eastern is high and terminates in a bluff point. The north coast is unapproachable in boats; the western part is stoney and without water and therefore uninhabited. There is a bay on the south coast with good anchorage. Authorities disagree about there being anchorage off Kotiapi, a village on the east side of Gebi.

Fow island,* off the south-west side of Gebi, is separated from it by a channel about a quarter of a mile wide, which forms a safe harbour with depths of 7 to 12 fathoms. It may be entered from either side of Fow island by keeping close to that island in order to avoid the shoals that lie in the middle of the passages on either side; the widest and best channel is between Fow and the two shoals to the eastward. There is also anchorage in the small bay eastward of these two shoals in 15 to 20 fathoms very near the Gebi shore, about 2 miles from Kotiapi the principal village on the north-east side.

A creek penetrates Fow island to a distance of one mile from the northern side; at the time of its exploration in 1772 it was a third of a cable wide at the entrance and 4 fathoms deep, widening within to 1½ cables with a depth of 10 to 16 fathoms; we have no late information concerning this creek.

Water may be obtained from a rivulet on the Gebi shore opposite the north point of Fow island, and also from a creek east of the south point of Fow.

The U.S.S. *Alert* reported in 1877 that in the channel between Gebi and Fow islands, depths of 7 to 12 fathoms were obtained where formerly 10 to 16 fathoms formerly existed; no good landing place for ships' boats could be found in this channel, neither could water be obtained. The shoals on the east side of Fow island are more extensive than was formerly supposed.*

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* *See* **Admiralty plan :—Anchorages in the islands off the N.W. coast of New Guinea, No. 912 ; scale,** $m = 0{\cdot}83$ **of an inch.**

Iyoi island, 5 miles from the north-east shore of Gebi island is low. The islet Utu, close to the N.E. of Iyoi is also low.

Siang island,† the outermost island of the north entrance to Gillolo passage and about 27 miles north-east of Iyoi, is a low flat island extending about 5½ miles N.N.E. and S.S.W., and nearly 5 miles east and west. There are soundings of 10 to 20 fathoms at a distance of 2 or 3 miles, decreasing towards the shore; a reef projects three-quarters of a mile from the north-eastern point. Eye island, off the north end of Siang, is small and low, covered with soundings of 7 fathoms at a mile distance to the westward; breakers have been reported to extend 1½ miles to the northward of Eye island. Hunter bank, having 10 fathoms over it, is said to lie 5 miles to the eastward of Siang.

Wiang island, about 9 miles south-east of Siang, is the northernmost of a group of islands, some of which are of considerable height, extending off the north-west end of Waigiu. The two Ine islets are the easternmost, and Ruib, the larger and higher, the southernmost; this island is surrounded by rocks which contract the passage between it and Waigiu, called Bougainville or French passage, as it was explored by the French expedition under Bougainville.

The channels among these islands are probably safe in many parts, but require caution, as the French corvette *Uranie* found a coral bank of 6 fathoms 5 miles N.W. by N. from the north end of Ruib.

Waigiu, Jef-fam (Tameai), **Battanta,** and **Salwatti** islands will be described in the next chapter.

Gag island, lying 24 miles E.S.E. from the southern end of Gebi, is about 8 miles long N.N.E. and S.S.W. and moderately elevated in uneven hummocks; the north-west coast is steep and barren, the north coast is not so steep, and wooded; cultivation is confined to the vallyes. The chart shows the south-east coast to be bordered by a considerable reef. There is a sand-bank off this coast covered with 3 fathoms water extending ⅛ of a mile north-west and south-east. The Netherlands steamer *Batavia* anchored close to this sand-bank with the south point of Gag island bearing W., and the east point N. by E.

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* United States Hydrographic Notice, No. 54 of 1877.

† *See* Admiralty plan. Anchorages in islands off the N.W. of New Guinea, No. 912; scale, *m* = 0·4 of an inch.

The channel between Gebi and Gag islands is sometimes taken by ships going outward, and may probably be advantageous to those coming towards Pitts passage during the south-east monsoon.

Jef-doif islands are a line of islands of which there is no account; they are placed on the Dutch chart 22 miles to the southward of Gag island, and are named Vlaming, the westernmost, Schoterug, Klaarbeek, and Kommerrust. The *Vettor Pisani* in 1872 found a bank of 7 fathoms about one-third of a mile long, at 5 miles S.S.W. of Vlaming.

Bu islands, 57 miles S. by W. of Gebi island, form a group of seven small low islands and several little islets, connected together by a reef, which surrounds the whole group. The islands are inhabited. Coral reefs extend along the south coast of them to a distance of 1½ to 2 miles, apparently with deep water between and occasional narrow breaks in the reef which appear to be deep but have not yet been examined. A reef, having one to five fathoms over it, extends 1½ in and easterly direction from the south-east point of the eastern island. Near the extremity of this reef, where there is 12 to 14 fathoms water, there is a strong tide-rip.* A reef is shown on the chart 3½ miles south of the western Bu islands, with no bottom at 150 fathoms at its edge, but whether or no this reef is connected with the island reef there is no information.

Grosvenor and Carmelita Banks.—The Grosvenor bank is placed on the chart 9 miles S. by E. of Popa (the easternmost Bu island), but its position is somewhat doubtful. It was first discovered by the *Grovenor* in 1763 and placed by her on the bearing S. ¾ E. from Popa. The *Castlereagh* struck in 1817 on a reef bearing S. from Popa, and in 1826 the *Dona Carmelita* passed on the northern side of a bank which she placed S. 20° W. 9 miles from the southernmost of the Bu islands; on the north side of it there appeared to be a depth of only 3 to 6 feet of water. It is probable that the two are one and the same shoal.

Kofiau island (Popa of charts and Sailing Directions prior to 1888) is about 18 miles long east and west, and 9 mile broad. It has two remarkable hills on the west part, which can be seen at a great distance; the one of semi-circular form like a bee-hive, the other of oblong shape, the rest of the island being entirely flat. Laat bay, on the east side is 4 cables long north and south, and 2½ cables wide, and

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*** *See* Admiralty plan. Anchorages in islands off the north-west part of New Guinea, No. 912; scale, *m* = 2·5 inches.**

17 to 22 fathoms deep in the middle.* The group of islands off the S.W. part of Kofiau island is sometimes called Tatas.

Caution.—The channel between Popa island and Kofiau is 15 miles wide; but between the Grosvenor bank and Essel island, south-west of Kofiau it is 10 miles wide. Vessels using this passage should give Popa island a berth of at least 3 miles, and as the neighbourhood of these islands has been only partially surveyed, great care is necessary when navigating this part of the eastern archipelago.

DANGERS in the SOUTH PART of GILLOLO PASSAGE.—Nabob shoal.—In 1845 the British ship *Nabob* passed over a coral reef 1½ miles long east and west, and 2 cables broad; the Bu islands bearing E. by S. and Pisang island south. The least water obtained was 3½ fathoms.

Archvar shoal, composed of coral, extends in an east and west direction nearly 1¼ miles, with a breadth of about one cable, and has an estimated depth of 2½ fathoms; it lies with the following bearings: Western Bu island E. by N., and Pisang island south. Position, lat. 1° 12′ S., long. 128° 53½′ E.

Pisang island rises to a height of 700 feet, and shows two peaks which can be distinguished at a distance of 27 miles. It rises abruptly from the sea without any beach; a small islet lies a quarter of a mile E.S.E. of it.

Kikik island, in lat. 1° 30′ S., long. 128° 37½′ E., is high; Lawin island, about 6 miles eastward of Kikik, is also high, and has an islet off each side; a coral reef extends one mile S.E. from the islet on the east side of Lawin. Button island, a small islet (Toppers Hudje on Dutch chart) lies 2½ miles N.N.E. of Kikik.

Bank.—There is a bank north of Button islet the extent of which, and depth of water upon which are unknown. In 1868 the American vessel *Brewster* anchored on this bank in 14 fathoms with Button isle bearing S. by E. 3½ to 4 miles; at the same time another vessel anchored 3 miles eastward of the *Brewster* in 12 fathoms.

Gasé island, lying 7½ miles eastward of Loyong island, and nearly of the same height, is a flat table-land for about three-fourths of its extent, sloping down to each end with a spit of rocks stretching about a cable's length from the south-east end. The island has a sandy beach, but no soundings at 1 or 2 miles off. The channels on either side are safe; that to the westward may be used with a westerly wind, but that to the eastward is wider, and seems better with a working wind.

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* *See* Admiralty Plan of Anchorages, No. 912, Laat Bay; $m = 4{\cdot}66$ inches.

Doubtful shoal.—The master of the ship *Talbot* reports (Mercantile Marine Magazine 1873) that his vessel grounded on, and passed over a reef in lat. 1° 51½′ S, long. 128° 3′ E. with the east side of Gasé island bearing N.N.E. and High Peak on Gomono island W.N.W. where the latest charts mark no bottom at 70 fathoms.

No soundings were obtained and there was no discolouration of the water. The bearings do not agree with the latitude and longitude given.

MISOL, a large island 45 miles long, and 15 to 20 broad, is but little known though of considerable extent. The interior is said to be inhabited by Arafura negroes, and the coast by a mixture of the negro and Malay races. It is generally level land, and of moderate height, and the shores are surrounded nearly on all sides by numberless small islands, the outermost of which to the N.W. and E.S.E. lie many miles off.

On the north side of the island Kasiem road offers anchorage in 8 fathoms at half a mile from the shore* ; and on the south side is Efbe anchorage†, visited by Captain Forrest in 1775. The channel to this latter anchorage, westward of Efbe island was partly examined by the *Marchesa* in 1883. Between the coral reefs extending from West channel island and Efbe, the entrance is about 2 cables wide, with depths of from 4 to 5 fathoms, deepening inside to 13 and 15 fathoms. There is anchorage in about 13 fathoms at one cable north-ward of the village on Coco-nut point, the north-west point of Efbe island. The channel eastward of Efbe island has not been examined.

To the eastward of the south-east point of Misol a range of islets and scattered rocks extend for 40 miles, terminating to the east in False Pisang—"Banana island"—a common Malay name in these seas.

Off the north coast of Misol are numerous islets and several sand banks, only to be understood by reference to the chart, extending over more than half way across the channel between the island and Kofiau, leaving, however, a clear route 15 miles in width between the southernmost of the Kofiau islands and the northern position of Fitzmaurice shoal (*see* below), and leading towards Pitt strait.

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* *See* Admiralty plan of Anchorages, No. 912. Kasiem road; scale, $m = 2{\cdot}5$ inches.

† *See* Admiralty plan of Anchorages, No. 912. Efbe anchorage; scale, $m = 2$ inches.

The Kanari islands lie to the north-west of Misol and form an extensive chain of flat, wooded, uninhabited islands, leaving a narrow passage between some of the groups which lie close to Misol. Captain Forrest on his voyage to New Guinea in 1775 in search of the nutmeg tree, visited Great Kanari, the largest and westernmost of these islands, and found good water in a pond situated on the south end. He anchored in Round harbour, so called by him, lying between two small islands which are at a short distance on the east side.

Fitzmaurice shoal, a rocky shoal with less than 12 feet of water over it, reported by the British ship *Fitzmaurice* in 1866, has two positions assigned to it; one with the Beehive hill on Kofiau island bearing N. by E., and the extreme of Great Kanari S.W. ¼ W., distant about 12 miles; and the other position with the summit of Kofiau island N. by W. and the north extreme of Great Kanari S.W. ¼ W.

PITT PASSAGE, so named after the vessel of Captain Wilson (who first took this passage in 1758), but named the Serang Sea on the Dutch charts, is the broad channel extending from Celebes island to the west, as far as the meridian of Misol to the east; it is bounded on the north by the Sula and Obi islands and the chain of small islands stretching thence to Kofiau; on the south it is bounded by Buru and Ceram islands.

This passage forms the second Eastern Route to China for sailing vessels described in the China Sea Directory, Vol. III. A vessel bound for China, arriving at the eastern straits in the months of December, January, or February, would find the route by Pitt passage and thence either by Pitt or Dampier strait or Gillolo passage into the Pacific, preferable to that by Makassar strait. This route would also be used by homeward bound vessels during the south-west monsoon in May, June, and July. The winds and currents in Pitt passage are very variable, and it may be crossed anywhere; it is, however, prudent to keep the weather shore when northerly winds prevail.

In case of falling to leeward of the north-west point of Buru every exertion should be made to pass it quickly. Instead of working to windward to do this, it is better to run southward of the island, and pass into Pitt strait to the eastward of it. During the north-west monsoon vessels which leave Amboina make to the northward along the east coast of Buru, where the winds are variable and squalls come off the land, and currents are rarely strong and sometimes favorable for the run northwards; while beyond Manipa and the channel that separates it from Ceram, southerly currents prevail in this season.

BURU (or BOURU) ISLAND, the third largest of the Moluccas, is 83 miles long, east and west, and 50 miles broad. It is exceedingly mountainous, especially in the north-west part, where mount Tumahu, the highest in the Moluccas, rises to 8,530 feet above the sea. Kaku Siel, 20 miles eastward of Tumahu, is not much lower, while Batu Bua, in the south-east part, is over 4,000 feet. A large lake, Wakaholo, lies at the eastern foot of Kaku Siel, 1,900 feet above the sea; rivers from this lake flow to both northern and southern shores.

The coast is in general bordered by a reef with deep water close to, and, with the exception of Kayeli bay on the east coast, affords no sheltered anchorage for large craft. The small native coasters find anchorage in the openings at the mouths of rivers, of which there are some twenty on the south coast, and four or five on the north coast. The mouths of all the rivers are obstructed by bars. Temporary anchorage for ocean vessels may be had at Bara bay on the north coast, at Uki road on the south coast, and also, it is reported, between Pela and Seruma points on the east coast.

Winds and Weather.—Buru is within the influence of the south-east and north-west monsoons; there is a regular wet and dry season, which varies on the northern and southern coasts. On the north coast the north-west monsoon brings rain, and the south-east monsoon dry weather; whilst on the south coast the south-east monsoon brings rain simultaneously with the rainy season at Amboina. The south-east monsoon lasts longer and brings more rain with it than the north-western, so that the rivers on the north coast, as well as those on the south, are swollen during that season. The climate is exceedingly moist, and reported to be unhealthy.

West coast.—Palpatu point, the north-western point of the island, has a reef projecting about a mile from it; the coast trends nearly south from this point for 24 miles to Sarmena point, and can be approached with safety to within a short distance, the coast dangers being indicated by the discolouration of the water. The three Tumahu islands lie just off the shore, and Fogie town, the principal one on the coast, is situated at the mouth of the river Nitu, opposite the southern Tumahu island. A reef projects from Sarmena point.

Rock.—A rock, the existence of which is doubtful, is shown on the charts in lat. 3° 38′ S., long. 126° 3′ E., about 5 miles off the shore.

North coast.—From Palpatu point the coast trends E.S.E. for 12 miles, and then turns north for 2 miles, forming Bara bay,* in which there are depths of 17 to 35 fathoms at half a mile from the shore, and no bottom with 50 fathoms at three-quarters of a mile. The chart shows anchorage in 17 fathoms, about 1¾ miles from the head of the bay, and half a mile from the south shore.

Lisela is a town of small importance at the mouth of a river about 18 miles E. by N. of Bara bay; reefs project off the mouth of the river, and between these reefs there is anchorage for coasters during the south-east monsoon.

KAYELI BAY,† on the east coast, is 4 miles wide at the entrance between points Karbu to the northward, and Ruba to the southward, and penetrates about 4 miles to the S.W.; both points are bordered by reefs, and there are soundings of 25 to 6 fathoms at half a mile from the northern point, but the reef off the southern point is steep-to, and no soundings are obtained on that side till near the inner shore of the bay. The southernmost shore of the bay is fronted by a shoal extending more than a mile off shore, with a very steep edge, the water shoaling rapidly from 20 to 2 fathoms within a cable's length.

The eastern shore is fringed by a coral reef to a distance of three-quarters of a mile, with 9 to 10 fathoms water at the edge. The Wai Apu, which has its course in the Lumara hills to the southward, enters the north-west part of the bay. The northern part has not been surveyed.

Kayeli town is on the southern shore of the bay. It is controlled by a *posthouder* under the Amboina residency, and most of the native rajahs live here. Fort Defence, an old work of 1778, is a conspicuous object, with massive embrasured walls standing about 800 yards from the shore. The town was made a free port in 1854. The exports are Cajuput oil and dried fish. The Netherlands India Steamship Company's vessels touch once a month.

Anchorage.—In the south-east part of the bay there is a space about 1½ miles wide between the reefs of the eastern and western shores, where good anchorage can be had, sheltered in both monsoons.

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* *See* Admiralty chart:—Plans of anchorages between Borneo and New Guinea, No. 911; Bara bay, scale, $m = 1{\cdot}5$ inches.

† *See* plan on chart, No. 911, Kayeli bay; scale, $m = 1{\cdot}5$ inches.

The water shoals gradually from 50 fathoms at 1½ miles from the shore, at the head, to 9 fathoms at about 2 cables distance. The best berth is in 19 fathoms, with the fort bearing S.S.W., distant half a mile, Red island, W. by N., and a rugged hill, called Mother and Daughter, on the southern side of the bay, bearing S.E. Vessels under sail must be careful to shorten sail in time, and to let go the anchor on reaching 25 fathoms, as the water shoals rapidly to the westward. Land and sea breezes are generally regular; the land wind comes off about 5 or 6 p.m., and the sea breeze makes about 9 to 11 a.m.

Directions.—Steer in midway between the two entrance points until the north point bears N. ½ E.; then keeping it on that bearing steer S. ½ W. until the fort is distinguished; this mark will take a vessel direct for the anchorage. Vessels working under sail must give both points a wide berth.

Tides.—According to Belcher it is high water, full and change, at 1h. 32m., rise of tide 4½ feet; but Horsburgh states that it is high water at 1h. 0m., and that tides rise about 6 feet, but are not regular.

Supplies.—Fresh provisions can be obtained, but are not plentiful; water can be obtained from a rivulet east of the fort, but it is not good.

EAST and SOUTH COASTS.—Pela point, the eastern point of Buru, can be passed close-to; from thence the coast trends nearly south to Seruma point, being about 600 feet high between these points. From Seruma it runs W.S.W. for 43 miles to Peka point, the southern point of the island; which must not be approached within a mile on account of a reef that projects from it.

Uki road.*—Uki or Lota island, high, steep, and wooded, lies about 5 miles E.N.E. from Peka point, and one mile off shore. Wayo reef, 5 miles in extent east and west, lies one mile east of Uki island with deep water between them. A shoal of 5 fathoms water lies between Uki island and the shore. The town of Uki is on the main coast N.N.E. of Uki island and on the left bank of Lihi river. Vessels can anchor N.E. of Uki island and south of the town, in 12 fathoms.

Tifu bay is a small port in the district of Masarete on the south-west coast of Buru. The entrance is 100 yards wide, and 11 to 14 fathoms deep. The port runs east and west about 600 yards, with a width of 200 yards and a depth of 6 to 9 fathoms water. The shore is bordered by a steep reef, and there is a dry bank at the bottom of the bay.*

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* *See* plan on Admiralty chart, No. 911, Uki road; scale, $m = 1·5$ inches.

Amblau island, 12 miles S. by W. from Seruma point, is 8 miles long E.N.E. and W.S.W., and 2,060 feet high. The channel between it and Buru is quite safe.

MANIPA STRAIT.—Between Manipa and Buru islands is a good and safe passage, and generally used by vessels from the Molucca passage to the Banda or Arafura sea.

Manipa island, about 14 miles E. by N. of Pela point, is 12 miles long east and west, and 2,100 feet high. On the south side there is a low wooded islet, Tuban, with a reef on its southern and western sides; anchorage may be had off this islet. Suangi islet, 1½ miles west of the extreme west of Manipa, is 327 feet high.

Kelang island is 12 miles long E.N.E. and W.S.W., and 2,400 feet high.

Kelang strait, between Manipa and Kelang, is 3 miles wide at the narrowest part, and quite safe; it is sometimes used instead of the wider strait of Manipa, but the tides in it are very strong.

Babi island is small and low; the passage between it and Kelang is only fit for boats, and the passage on the other side between it and Ceram is narrow and only 3 to 5 fathoms deep; this passage is used by small coasters.

Boano island is 10 miles long N.E. and S.W., high and rugged to the westward, but low to the eastward. A reef on which the British ship *Ada* struck is said to lie about 3 or 4 miles from the north-west part of Boano island, with the south point of that island bearing S. by W. ½ W., and the north point E. by N. ½ N. The extent of this reef to the westward is uncertain; soundings of 11 fathoms have been reported at 4 miles west of the islets marked about the centre of the west coast.† Broken water and tide rips extend for a considerable distance off the north-east point of Boano, to which a wide berth should be given. The channel between Boano and Ceram is 3 or 4 miles wide, but is contracted by small islets and shoals which stretch along the Ceram shore. The northern part of it is said to be safe.

CERAM ISLAND is about 180 miles long, east and west, and 25 to 35 miles wide. In the immediate vicinity of the coast the land is low and often swampy, whence it rises to a central table-land of considerable elevation, bearing a continuous mountain range which traverses the island from east to west. There are Dutch *post houders* at Wahai on the north coast, at Waru on the east coast, and at Amahoi and Kai-Ratu on the south coast. A native pathway crosses the island over several mountain spurs from Sawai bay on the north coast to Makariki near Amahoi, and this is almost the only portion of the interior known to Europeans.

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* French *Instructions Nautiques.*

† H.M.S. *Nassau* in 1872, and *Molukscke Archipel*, p. 209.

The island is subject to the Resident of Amboina, with the exception of the eastern extremity from Tobo to Waru, which, with the Ceram Laut and Matabela islands, is under the Assistant Resident of Banda.

Winds and Weather.—On the north coast of Ceram during the south-east monsoon, the weather is fine with regular land and sea breezes; the north-west monsoon is the wet and squally season, though it brings fine weather at Amboina, and probably all along the south coast; but there are no records of the weather on the south coast. During the north-west monsoon the wind is frequently fresh from west and W.N.W. during the day, dying away towards night and veering to the W.S.W. with a light breeze in the morning.

NORTH COAST of CERAM.—From Talanuru point, the north-west point of Ceram, the coast trends east, and is safe and steep-to for 50 miles, to where the chart shows a reef 2½ miles off the coast; it then turns about E.N.E. for 10 miles to a low point, Paha, to the north and north-west of which, some 8 miles off, lie several low wooded islands, surrounded by shoals. Nusa Ela is the outermost of these islands, which are called Tugu islands in the *Moluksche Archipel.*

Sawai harbour.*—Immediately to the east of Paha point there is a wide bay, named Selema from a village at the head of it. Sawai harbour, in the south-east part of this bay, is an inlet 1½ miles long, and three-quarters of a mile wide, with a depth of from 20 to 40 fathoms water, muddy bottom, affording good anchorage in the south-east monsoon. On entering the bay a vessel should steer south for a hill near Selema village, passing west of Kalapa and Atui islands on a reef which extends northward and westward nearly a mile; and when clear of the reef she should haul eastward into the harbour.

Anchorage may be had near the Ceram shore with Atui island bearing north; there is also said to be anchorage off the village of

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* *See* Admiralty chart, Plans of Anchorages between Borneo and New Guinea. Sawai harbour, No. 930; scale, $m = 0·77$ of an inch.

Sawai in 15 fathoms, soft mud, with the fort bearing S.E. ¾ E., the western point of the harbour (White cliff) W. by N. ½ N. and Atui island N.N.W. ½ W.*

Wahai and Hatiling bays† lie about 25 miles eastward of Paha point, and directly to the westward of Sekola point, the northern point of Ceram. The coast as seen from the offing is nearly straight, it is therefore necessary when making for either of these bays to keep within 3 or 4 miles of the coast in order that the houses may be seen. The land in this neighbourhood appears to be more cleared than elsewhere.

Wahai, the western of the two bays, is a small inlet between reefs which extend half a mile from the shore west of the bay, and three-quarters of a mile from the shore to the eastward ; on the latter reef there are sand banks which partly dry. The inlet is 2 cables wide and 8 fathoms deep at the head. An earthwork fort stands on the shore at the head, and a mole extends over the fringe reef into 3 fathoms water. The anchorage is in 7 fathoms, half a cable from the end of the mole.

Directions.—The chart shows two beacons with conical tops marking the entrance of the inlet, one on either side, and piles marking the channel on each side to the head. The *Moluksche Archipel* states that the head of the mole bearing S.S.E. ¼ E., will lead in between the entrance beacons. Sailing vessels can only enter with a leading wind ; and in the north-west monsoon must either tow or warp out, as they are liable to encounter a swell outside and a set to the eastward before gathering way.

Tides.—The information about the tides is rather discrepant ; Lieutenant de Boer, in 1832, reported that there was only one tide in 24 hours, and that it was high water full and change at 0h. 30m., the greatest range being 6½ to 7 feet. The *Merman*, in 1839, reported that there was only one tide in the 24 hours, and that the range at full and change was between 3 and 4 feet ; again Captain Hunter, in 1840, states that it is high water, full and change, at 6h. 0m., and that there is only one tide in 24 hours, the range being 8 feet.

Hatiling bay, one mile east of Wahai, is included between the eastern reef of that bay and the reef that borders Sekola point to a quarter of a mile out and nearly dries. The entrance, which is only 2½ cables wide, is half a mile west of Sekola point, and has a depth of 20 to 29 fathoms of water. The bay penetrates 1¼ miles N. by E. ½ E. from the entrance to the head where there is a village, the depth of water gradually diminishing to the southward. A small shoal, covered by 3 feet of water with 7 fathoms close to, lies in the middle of the bay east of Aentopra point, the western point of the bay, and N.N.W. of the village. The anchorage is 4 cables N. by W. of the village in 14 fathoms; the southern end of the bay is very shallow.

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* *Moluksche Archipel*, p. 214.

† *See* Admiralty Plan, No. 930, Wahai and Hatiling bays ; scale, $m = 3{\cdot}5$ inches.

Supplies.—Wood, water, and some fresh provisions can be procured at Wahai and Hatiling bays.

Coast.—From Sekola point the coast trends about E. by S. for 53 miles to Lama point, and then S.E. for 14 miles to Timor point, the north-eastern point of Ceram; it is fringed by a narrow reef throughout the whole of the distance. Anchorage may be had in Kobi bay, 23 miles east of Sekola point.

Leuwarden bank, the west end of which is 7 miles E. by N. from Lama point, is 2 or 3 miles in extent, and very dangerous; the west side is a white sand bank, and the eastern side a ledge of rocks, some above water. There is deep water near it, and the channel between it and the main land is considered to be safe.

Waru bay.—From Timor point the coast trends south for 20 miles, and then turns east for 10 miles, forming the great bay of Waru, with the town of the same name at the head of it. Anchorage can be had off the town in 12 fathoms, and also off Baru, a village 5 miles to the northward. The coast between Baru and Waru is bordered by a reef, as is also the coast from Waru to the eastward.

Parang island, 4 miles north of the east point of Waru bay, is 4 miles long N.W. and S.E. and sandy: it can be seen at a distance of 20 miles. It is surrounded by a reef which extends 2 miles to the northward, and should be given a wide berth.

Hu point, the eastern point of Ceram, has an islet, Akat, to the northward of it, connected with the point by a reef. The chart shows anchorage between Akat and the coast of Ceram. Orlem rocks lie 4 miles N.N.W. of Hu point, and Razaket islet close to the coast about 2 miles to the southward. The coast south of Razaket is clean and steep-to.

Madurang island, 8 miles E.S.E. of Hu point, is small, high, sandy, and wooded. It has a small reef on the south side, but the other sides can be approached with safety.

Keffing islands are included on a large reef, which likewise embraces the south point of Ceram as far as 6 miles to the westward along the south coast, and extends 3 miles out to the southward and eastward. Little Keffing, the eastern island, is low, sandy, and well populated.

Keffing strait is the passage between the reef off Keffing islands and that to the eastward surrounding Gisser island, upon which there are two sand-banks. The northern entrance appears to open towards the N.W., north of Little Keffing, and the southern entrance to open to the S.S.W, south of Little Keffing ; but the charts differ very much about this locality, and are not to be trusted. The narrowest part of the channel appears to be about a mile wide, and the depth from 12 to 30 fathoms, shoaling to 8 fathoms near the reefs. The tidal streams are very strong in the passage.

CERAM LAUT.—" Ceram out to sea " is a cluster of islands on one coral reef, 15 or 18 miles long, which, as usual, is very shoal at the edges and drops at once into deep water. Gisser and Kiluaru islets to the westward and the three Goram islands to the E.S.E. are included in the group. The most important islands are Gisser and Kiluaru, separated from each other by a narrow channel, which affords good anchorage in both monsoons in 10 fathoms, sand and coral. The population of the group in 1881 was given as 2,000.

Gisser island* is low, sandy, and surrounded by a reef which extends 6 miles towards the south, and has on it two sand banks above water. The anchorage is 1½ cables east of the north-east point of Gisser. There is a government depôt of coal at Gisser, but coal can only be obtained by means of an order from the Resident of Amboina. The stock in store is only about 200 tons.

The Netherlands India Steamship Company's vessels touch at Gisser every third month.

Kiluaru is a small sandy islet only a few feet above the level of the sea, the houses being built on piles ; but it has, nevertheless, a large Bugi and Ceram population, and is largely resorted to by traders from New Guinea, the Arru, Ké, and other islands, as well as by those from Celebes. The principal articles of trade are tripang, pearl-shell, edible birds' nests, &c. The Ceram Laut reef extends 3 miles out on the north-west side of Kiluaru, which can, therefore, only be approached by boats on this side.

Ceram Laut, the largest island of the group, is high and hilly, and has, or had in 1850, an exceedingly high tree on it which makes a good mark. The other islands on the reef are low, except Kidan, which is high.

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* *See* Admiralty plan, No. 930, Gisser island ; scale, m = 2·35 inches

Kon or Gono islets are described in the *Moluksche Archipel* as the most easterly on the reef, but the chart shows a 10-fathom channel between these islands and the Ceram Laut reef.

The Goram islands consist of Suruaki, Goram and Manavoka. Suruaki (Panjang) is surrounded by a reef which extends furthest to the south, leaving only a narrow passage to the north between it and the Ceram Laut reef; it is not advisable to attempt this passage, but the channels between the Goram islands are safe. Goram itself, the easternmost, is about 9 miles long N.N.W. and S.S.E.; the centre is high, but the coast is low and fringed by reefs which dry at low water. The island is well populated, and carries on a fair trade with New Guinea.

During the south-east monsoon anchorage may be had on the western side between the reefs and the shore near the village Ondur in 14 fathoms. The entrance to this anchorage may be made by bringing a small round hill, higher than the adjacent hills, to bear N.E. by N., and then steering for it on that bearing; but it would be dangerous to enter without a pilot. During the north-west monsoon there is anchorage off Kailakat on the south-east coast in 17 fathoms, but here, also, a local pilot is required, as the bay is obstructed by reefs.

Manavoka, the southern island, is the highest of the group; it is steep-to, and affords no anchorage.

The MATABELA ISLANDS, are under the control of the Rajah of Goram. They are sparsely inhabited, carry on very little trade, and afford no safe anchorage. Inga, the northern islet, lies 12 miles S.E. of Manavoka; the channel between them is safe. Inga and Watubela are connected by a reef, and are both high islands, while Kasiwui is the largest and highest of the whole group. Baan islands are two small uninhabited islets lying S.S.E. of the south point of Kasiwui,* surrounded by a reef which extends furthest east and west. Kurkap island, east of Baan, is a small sandy islet surrounded by a shoal of sand and rock which extends 2 miles of the island. The *Triton* in 1828 passed between Kasiwui and these three islands and observed no dangers.

Towa island is about 1,000 feet high, and sparsely populated. The *Nautilus* in 1838 passed between Towa and Baan without observing any dangers, though the native pilots on board reported the passage to be foul. Uran island, 6 miles east of the south point of Towa, is small, sandy, and wooded, and surrounded by a reef.

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* At a distance of 6 miles by the *Moluksche Archipel*, but only 3 by the chart.

The group to the southward will be treated in the next chapter.

The SOUTH COAST of CERAM is high and steep-to, with no known dangers off it except those off the south-east point, and those near Hoya point. It is indented by three great bays, but these only afford anchorage very close to the shore. In each monsoon a counter current will generally be found close to the coast which can be utilized by vessels working against the monsoon. The south-east point of Ceram, as stated above, is surrounded by a reef, and the coast is foul for 14 miles W.N.W. as far as Gosai islet, and should not be approached within 4 miles.*

Kisa Laut† affords secure anchorage in the south-east monsoon, the bottom sloping gradually from 20 to 5 fathoms, sand. A sugar-loaf hill called Tobo (mount Osong) lies north-west of the road. Water can be obtained here but with difficulty. From Kisa Laut to Hoya point the coast is safe to approach.

Hoya or Teluti bay, is about 20 miles wide and 4 miles deep to the northward. The chart shows some shoals on the east side near the point, and also two banks in the north-west part of the bay near the shore. The western point of the bay, Hoya point, is low and shelving, with a reef extending from it 3 miles south-east, with two low islets on it; this reef runs 7 miles along the shore to the westward of the point. There is anchorage in 10 fathoms about 2 miles north-west of Hoya point,‡ and also off the town of Teluti on the north shore of the bay.

Elaputi bay, 27 miles west of Hoya bay, is about 10 miles wide between the entrance points, and penetrates 10 miles to the north-east. The whole coast of the bay is steep; in the south-east part of the bay there is a little port, Amahoi,§ the east shore of which is low, marshy, covered by mangroves, and bordered by a reef nearly dry at low water, which fills up half the bay, leaving between it and the western shore a channel one-quarter of a mile wide, and 6 to 25 fathoms deep. A patch of 3½ fathoms water lies at the head of the port, and a shoal with 4½ feet over it at low-water lies in the roadstead, N.W. of the pier at the head of the port, and distant about

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* *Moluksche Archipel.*

† *See* Admiralty plan, No. 911; Kisa Laut; scale $m = 2{\cdot}4$ inches.

‡ *See* Admiralty plan, No. 911; Tehoru anchorage; scale $m = 2{\cdot}4$ inches.

§ *See* Admiralty plan, No. 930; Amahoi bay; sca;le $m = 2{\cdot}3$ inches.

175 yards from the shore. The anchorage is in 18 fathoms N. by W. of a mosque at the head of the port, and 2 cables from the western shore, which is 16 feet above the level of the sea. There is no other anchorage in Elaputi bay, and during the south-east monsoon there are heavy breakers along the north-west shore, making landing very difficult.

Piru bay, the westernmost on the south side of Ceram, is a wide bay, bounded on the west by the peninsula which terminates in Sial point; and fronted on the south by the island of Amboina. The islets Babi and Kasa, at the head of the bay, are connected by reefs leaving a narrow channel between Babi and the coast of Ceram; at the northern end of this channel is Kaibobo road* in which there is anchorage in 18 fathoms. The chart shows several banks in the northern extremity of the bay, N.W. of Babi islet, and the Dutch chart shows anchorage at this end of the bay. The shore to the east of Babi is bordered to a distance of 8 miles by a reef which reaches 3 miles out.

WEST COAST OF CERAM.—Ceram island terminates to the westward in a peninsula 6 to 15 miles wide, the outer coast of which trends south-west from Talanuru point for 23 miles to Hatan point, the westernmost point of Ceram; it then turns south for 25 miles to Sial point. On the east side of this peninsula is Piru bay. Some small islets and reefs stretch along the north-west shore from Talanuru to Hatan point, and the range of hills terminating at Sial point is over 1,300 feet high.

Gunong Sudi anchorage,† south of a group of islets about 5 miles N.W. of Hatan point, has 22 fathoms depth of water at 7 cables from the shore, and 19 fathoms at 2 cables from the shore, with Mount Sudi, a coast hill, bearing N.E. by N., and the south point of Nitu (the innermost of the islets) bearing N.W. There is a watering place at the foot of Mount Sudi. Sial point is steep-to.

The AMBOINA ISLANDS consist of Amboina, Haruku, Saparua, Melano, and Nusa Laut. They are all high, and when seen from the southward appear as part of Ceram. The passage between these islands and Ceram is safe, but in working through it a wide berth should be given to the north coasts of Saparua and Haruku on account of the reefs that project from them. The coast of Ceram is said to be clean.

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* *See* Admiralty plan, No. 911; scale, *m* = 2·4 inches.

† *See* Admiralty plan, No. 911; scale, *m* = 1·5 inches.

AMBOINA ISLAND is the most important of the spice islands, and the town of Amboina is the seat of the government of the Moluccas. The island consists practically of two islands of unequal size lying parallel to each other their greater lengths being in an E.N.E. and W.S.W. direction, united at one point by a low sandy isthmus less than a mile in width. The northern, and larger, peninsula, called Hitu, has a length of about 30 miles with a maximum width of 10 miles; it is very mountainous, some of the peaks rising to over 3,000 feet. The southern peninsula is about half the size, and the highest mountain rises to 2,167 feet.

The Three Brothers are three islets lying off the north-west coast of Amboina, the northernmost of the three is 382 feet high. There is a passage between them as well as between the southern islet and the coast, but the tidal streams between are exceedingly strong.

Amboina bay.[*]—This deep inlet penetrates into the island some 15 miles from the south-western end in a N.E. by E. direction, its entrance points being Allang point on the west and Nusaniva on the east. These points are both steep-to and bear E. and W. from each other, 6 miles apart. About 3 cables length S.S.E. of the latter point there is a narrow bank of soundings of from 15 to 20 fathoms, on which a vessel might anchor during a calm. It is detached from the shore, for no ground is got when Allang and Nusaniva points are just open, or touching each other. Inside Nusaniva point there is a small indentation, called Labuan Radja; but no soundings at 60 fathoms are obtained on either side at a cable's length from the shore, nor within half a cable's length in many places until well up.

The town of Amboina is situated about 8 miles from the mouth, on the east side of the bay, which is bordered here for 1½ miles by a steep bank about a cable wide; the edge of this shoal is generally marked with fishing stakes, which may also be seen in many parts of the bay; the water deepens rapidly from the bank, and a depth of 40 to 45 fathoms will be found at a distance of 3 cables from the shore.

The town is clean, neat, and regularly built, with straight and wide streets intersected by numerous streams, and bordered by a profusion of flowering shrubs. It contains two churches, a fine hospital, a town hall, and other buildings. The mercantile part of the town is in a long street facing the sea, with another behind it. As in other Dutch towns in the east, there is a distinct Chinese and Arab quarter, and most of the retail trade is in the hands of Chinese.

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[*] *See* Admiralty plan, No. 911, scale, m = 4·8 inches.

Fort Victoria is an irregular hexagon facing the sea; in front of it is the ordinary landing-place, and the main road to the town passes through it, there being only a pathway outside the glacis to the town. The jetty in front of the port is about 80 yards long, of rough stone, except at the outer end, which is of wooden piles; the depth of water at the steps is about 2 feet at low water; at the outer end it is 2 fathoms. There is another wooden jetty off the redoubt 4 cables south-west of the fort, alongside which steamers go when discharging cargo. The depth of water at the head of the Redoubt jetty is 22 feet, at low water springs.

Light.—A *white* lantern light is shown from the pier off fort Victoria; it is not to be depended upon, and might be taken for an anchor light.

Anchorage.—The best anchorage is off the end of the Fort jetty in 16 to 26 fathoms, with the fort flagstaff bearing from E. ½ S. to E.S.E., and the redoubt from S.S.W. to S. ½ W. Outside this area the water is inconveniently deep for anchoring. The old practice of securing a hawser to anchors on the bank is not now resorted to.*

Supplies.—Fresh meat and bread are dear, but other provisions including game, fish, fowls, and every variety of fruit, are abundant and moderate in price. There are no facilities for watering ships, but water can be obtained from a river on the north-west shore of the bay opposite the town.

Coal-wharf.—The coaling wharf is at Tanjong Mungayen, a little more than a mile south-westward of the town pier, and there are 4 fathoms alongside of it at the head at low water.

Ships intending to coal at the wharf should steer in with their heads to the south-eastward, keeping about half a cable outside the extremity of the wharf, and when the centre of the ship is abreast the centre of the wharf let go the port anchor in 10 fathoms and haul in by means of the wooden piles placed at convenient distances along the shore.

The red buoy to the north-eastward of the wharf is lightly moored, and intended only for the off-fasts of the small steamers frequenting the port. Large vessels will therefore find it advisable to drop their stream anchors from the port quarter in 19 fathoms when north of the wharf as they come in, as the wharf is slightly built and the north-east wind presses them strongly against it.

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* A red mooring buoy is placed 1 cable N. by W. ¼ W. from the pier, for the guard ship.

A large quantity of coal is stored here, principally from Newcastle-on-Tyne, the price being about £2 10*s.* per ton. Labour can be obtained at a Dutch rupee of 1*s.* 8*d.* a day, but only 60 tons a day is shipped.

Inner harbour.—The entrance to the inner harbour commences at 1¼ miles above the town; it is 300 yards wide between the sandy flat on the south shore and the steeper north shore, and 6 to 10 fathoms deep; it then widens out into a large basin, 3 miles long by 1½ miles broad, with tolerably even depths over it, varying from 12 to 18 fathoms. It is well sheltered from all winds, but is considered unhealthy, and is not used by ships. The head of the harbour is separated from Baguala bay on the eastern side of the island, by the narrow sandy isthmus only that connects the two peninsulas into which Amboina is divided.

Mails.—There is a monthly mail-steamer from Makassar and Sourabaya, which touches at Koepang and Dilli in Timor, and the Banda islands, on the voyage to Amboina, touching at Ternate and either Kema or Manado in the Celebes, on her return. The voyage is made the reverse way every alternate month.

Tides.—It is high water, full and change, in Amboina bay at 2h. 30m. Springs rise 8 ft., neaps 3¾ ft.; they are, however, irregular, being affected by the wind. The tidal streams in the bay are slight and greatly influenced by the wind.

Weather.—From a meteorological register kept at Amboina, extending over a period of four years ending 1874, it would appear that the north-west monsoon commences about November and lasts till April; but only during January, February, and part of March do the winds blow steadily, and then between north and north-west. The south-east monsoon blows from May to the beginning of September, after which it becomes variable to the end of November. In December the wind is variable from north through west to south, and in March and April from north-west to south-west.

Rain falls in every month of the year, the driest being from October to April inclusive, with an average of 13 days' rain and 8 inches fall for each of these months. The other months average 21 days' rain, with a fall of 27 inches.

The mean temperature for the whole year ranges from 74° to 86° Fahrenheit.

South and east coast of Amboina.—From Nusaniva point the coast runs E.N.E., bordered by a narrow reef for 17 miles, and then turns into Baguala bay. This bay has several shoals in it with deep water close to them; the depth of water diminishes rapidly at the western end, and is only 5 fathoms at 2 miles from the head of the bay. To the north of Baguala bay the coast forms a bight, in which the chart shows anchorage without stating the depth of water.

North coast of Amboina.—This is very steep-to with depths of 20 to 30 fathoms close to the shore; there is a small settlement at Hila, but no secure anchorage for vessels of any size on account of the great depth of water.

Haruku island is roughly triangular with the apex to the east, about 9 miles long, and 1,200 feet high in the centre. The channel between this island and Amboina is 3 miles wide at the southern end, but is reduced to 2 miles width at the northern end by Pombo islet, and a reef north-west of it. On the north side there is a bank above water, and an isolated reef; and a narrow reef borders the north-east, east, and south coasts. Pombo islet is sandy and surrounded by reefs.

Saparua island has a hill some 1,000 feet high on the north-west end, but the east coast appears low. The channel between Saparua and Haruku is about 1½ miles wide in the narrowest part; a vessel using it should keep on the Haruku side, as the reefs on the Saparua side extend to one mile from the shore. The tidal streams in this channel are very strong.

Saparua bay,* on the south side of the island, lies between Paperu point, 3 miles north of the south point of the island, and Torona point opposite; it affords good anchorage in the north-west monsoon. The bay is fringed by a reef which extends 1½ cables out on the south side, and 3 cables, in some places, on the north side. The town of Saparua is on the north shore near the head of the bay. The best anchorage is in 10 fathoms, sand and mud, 2 cables S.E. by S. of fort Durnstede; care must be taken not to approach nearer to this fort, as there are patches of 2 to 3 fathoms water at 1½ cables distance from it.

Tides.—It is high water, full and change, at 1h. 0m., springs rise 6 feet.

Melano islet, south-west of Saparua, is about 700 feet high, steep-to to the south-east, sloping to the north-west.

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* *See* Admiralty plan, No. 911; Saparua bay, scale, *m* = 2·4 inches.

Nusa Laut, the easternmost island of the Amboina group, is about 3 miles long N.E. and S.W., 800 feet high, and bordered by a reef, which extends to a quarter of a mile from the shore. Nalahia bay,* on the north coast, affords anchorage sheltered from the south, in 20 fathoms, one cable east of a scarped point on the west side, and 2 cables W.N.W. from a white beacon on the east shore.

The BANDA ISLANDS† consist of ten islands, six of which lie close together, and between them form the harbour of Banda. These last are Gunong Api, Neira, Lontar or Great Banda, Kraka, Pisang and Kapal. The others are detached, and lie within a radius of 17 miles of Gunong Api.

Winds and Weather.—The north-west monsoon sets in about the middle of November, and occasionally blows with violence; the south-east monsoon seldom blows so fiercely. Rain falls in both monsoons, the dry months being September and October, when light variable winds and calms prevail.

Suangi, the north-western island, 17 miles N.W. of Gunong Api, is very small, and 400 feet in height; Rhun, 13 miles W. by S. of Gunong Api, is 620 feet high, and has a reef on the northern side, with an islet upon it; Wai is 6 miles W. ½ S. of Gunong Api.

Gunong Api is a steep volcanic cone, 2 miles in diameter, and 1,858 feet high. It is clothed with bushes to within 700 feet of the summit, and continually emits sulphurous steam; the eruptions of this mountain have been frequent and destructive; the last one took place in 1852.

Neira island, on the eastern side of Gunong Api, is about 1¾ miles long N.N.W. and S.S.E., and rises to a height of 795 feet. The European settlement and seat of Government are on the southern side. A reef, about a cable wide, borders the island on its northern, eastern, and southern sides, the salient points of the shoal-water towards the roadstead are marked by beacons. Fort Nassau stands on the south-west point of the island. Three piers run out from the shore; one, the commercial pier, where steamers discharge, is near Fort Nassau; the depth of water at the head of this pier is 14 feet, low water springs; another, the official pier, is farther east, opposite the Resident's house. The third is a small pier to the west of the town.

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* *See* Admiralty Plan, No. 911; Nalahia bay, scale, $m = 2{\cdot}47$ inches.

† *See* Admiralty chart, Ports in Arafura Sea, No, 1460, Banda harbour; scale, $m = 1{\cdot}46$ inches.

The channel between Neira and Gunong Api, named Sun strait, is of irregular breadth and depth, and at the southern end is less than half a cable wide, and only 3 fathoms deep; tidal streams run through it with great force, and it is seldom used except by small vessels. Kraka islet lies in the middle of the northern entrance, the passage between it and Gunong Api being better than the passage between Kraka and Neira, which is narrowed by reefs on both sides.

Great Banda island, or Lontar*, is crescent shaped, 7 miles long by one or 2 miles broad, with a centre ridge 700 to 800 feet high at the extremities, and 1,500 to 1,700 feet high in the middle. The western half of the northern shore is bordered by a reef which extends 2 to 3 cables out, and considerably narrows the channel between Lontar and Gunong Api; the rest of the island is also fringed by a narrow reef, which is widest in the little bays of the outer coast, making landing from boats difficult. The principal nutmeg plantations are in this island.

Pisang and Kapal islands are continuations of the crescent of Lontar, separated from it and each other by deep channels about 3 cables wide, and free from danger, but the eddy currents in them are strong. Pisang is planted with coco-nut palms, and is said in the *Moluksche Archipel* to be the Lepers' island. Kapal is bare.

Anchorage.—Soundings of 25 fathoms commence three quarters of a mile east of the south point of Neira, and from these lessen gradually to 5 fathoms at the western part of the roadstead. The anchorage is in 7 fathoms, with the south-eastern point of Neira bearing N.E. by N., and fort Nassau N. by W., about one cable east of a detached shoal of 3 and 3½ fathoms water. By keeping the south-east point of Neira open of the north point of Lontar a vessel will keep outside this shoal.

Tides.—According to the *Moluksche Archipel* it is high water, full and change at 12h. 0m.; springs rise 14 feet, but according to Horsburgh it is high water on the shore at full and change at 2h. 0m., and at the anchorage at 4h. 0m., and the rise of tide is about 9 or 10 feet. The Austrian corvette *Saïda* reported, in 1885, that the flood stream runs from Gunong Api towards Pisang island at the rate of 3 knots an hour, and that the range is 9¾ feet.

Directions for Banda harbour. — The western or Lontar channel is reduced to an available width of one cable by the reefs on the south side; the Gunong Api side should therefore be kept aboard in using this channel. The salient points of the reef (on the south side) are marked by beacons consisting of pole and triangle. The eastern or Neira channel, between Neira and the north point of Lontar, is quite clear. Sailing vessels enter by the eastern channel during the south-east monsoon, and go out by the western; and take the contrary direction during the north-west monsoon.

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* **Lontar is the Malay for Palmyra Palm.**

Trade.—The principal exports are nutmegs, cloves, and oil extracted from the Kanari tree, besides a small amount of tripang and birds of Paradise from New Guinea. The European trade is in the hands of one commercial house, the *Nederlands Handel Maatschappy;* the retail trade and the trade with New Guinea, Ceram, and Ké islands is carried on by Chinese. A vessel of the Netherlands India Steamship Company touches once a month, and the port is rarely visited by any other European vessel.

Supplies are scarce and dear; water can be obtained by the Lontar shore, at a place E. by S. of the anchorage. Coal is generally to be had, but the supply is always small, and not to be relied on.

Rozengain island, 7 miles S.E. of Great Banda, is tolerably high, and visible at a distance of 20 miles; it is inhabited, and nutmegs are grown there.

Rozengain reef lies 6 miles S.E. of Rozengain islands; the sea breaks heavily over this reef.

CHAPTER XII.

BANDA SEA ; KÉ, ARRU, SERWATTI, AND TENIMBER ISLANDS.

Variation 2° 10′ to 2° 50′ E. in 1890.

BANDA SEA.—The space between the south-east portion of the Celebes and the islands lying off it on the one hand, and New Guinea on the other, having Ceram on the north and the chain of islands extending eastward from Timor on the south, has been called the Banda sea.

All the islands in this sea are subject to the Dutch government, who have Posthouders at the principal places. A steamer of the Netherlands India Steam ship Company visits the islands once in three months, starting from Makassar and making the circuit as follows :—Amboina, Banda, Kisser, New Guinea, Ké islands, Arru islands, Timor Laut, Baba, Damma, Letti, Kisser in Timor, Wetta, and so back to Banda.

The Banda islands would be properly included in the description of this sea, but for greater convenience they are given in the last chapter with the Amboina islands. The Buton islands and the chain of islands from Timor westward are out of the scope of this work, Wetta and the islands from Timor eastwards will be included in this chapter.

Soundings and Temperature.—Three deep soundings were taken by the *Challenger* when crossing the Banda sea, the greatest depth attained being 2,800 fathoms N.E. of Bird island ; five other soundings of over 2,000 fathoms are recorded on the chart. In the serial temperatures taken by the *Challenger* the temperature remained the same from 900 fathoms to the bottom, indicating that the depth of water over the ridge separating the basin of the Banda sea from the Pacific and Indian oceans does not exceed that depth.*

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* A sounding of 4,000 fathoms near the Banda islands is shown in the chart, but this great depth, obtained about the year 1855, must be regarded as doubtful, the *Challenger* having obtained 1,450 fathoms 5 miles from the same spot with improved methods of sounding, and her report does not endorse the supposition of a depth requiring so steep a gradient in the neighbourhood.

Tides.—The recorded observations of the times of high water, and of the direction of the tidal streams, are unfortunately too few to afford even a fair estimate of the movements of the tides. The tidal wave enters the Banda sea from the North by the Molucca passages and Pitt channel ; and from the S.W. by the channels on either side of Timor ; but the place of meeting of these waves has not been determined. The only reliable information obtained as yet is as follows :—According to the *Moluksche Archipel* the flood stream in the Banda sea sets to the east, and H.M.S. *Flying Fish* observed off the Arru islands that the "flood-tide sets S.E. 2 knots." The tides are probably largely influenced by diurnal inequality, as some times only one tide has been observed in the 24 hours.

Winds, weather, and currents have been described in Chapter I.

BANDA ISLANDS.—*See* Chapter XI.

Turtle islands are three small wooded islands, low, and surrounded by coral reefs to a distance of 2 or 3 miles ; they are therefore dangerous to approach at night. The northernmost of them is shown on the chart in lat. 5° 22′ S., long. 127° 45′ E. ; the others lie, respectively, South 4 miles, and S.W. 2 miles from it.

Lucipara islands, 11 miles S.W. of Turtle islands, are a group of five low-wooded islands on a reef occupying a space 5 miles in length E.S.E. and W.N.W. ; they cannot be seen more than 12 miles from the deck. The channel between Lucipara and Turtle islands is reported to be safe.

William reef lies 2 miles S.W. of Lucipara island.

Gunong Api island is a high conical volcano, 1,378 feet high, visible 45 to 50 miles off, from the summit of which smoke is generally issuing. It is steep-to and may be approached with safety.

Mano or Bird island is about one mile long N.N.W. and S.S.E., and half a mile wide, rising like a prism with sits ides sloping from the sea at an angle of about 30 degrees to the summit, which is 880 feet high. On the southern side there is an open crater from which sulphurous vapour freely escapes ; the lower part of the northern side is wooded, but on the higher slopes the trees have been killed. A coral bank projects 2 cables from the N.N.W. point where there is a black sand beach ; the rest of the island is steep-to. The summit is in lat. 5° 23′ S., long. 130° 18′ E.

The Matabela islands were described in the last chapter.

Bun and Kanalur islands.—At 26 miles S.E. ¾ S. from Towa, the southernmost Matabela island, there is a group consisting of Bun, Kaidos, Kaimeer, and the larger island Kanalur or Koor. The islands are all of them wooded. Bun, the northernmost, is in lat. 5° 08′ S., long. 131° 57½′ E. Kaidos is shown on the chart to be connected with Bun by a reef; both islands are low. Kaimeer lies about 4 miles S.S.E. of Bun; it is about 150 feet high.

Kanalur, the southernmost island of the group, is about 5 miles long N.E. and S.W. and rises to the summit by a succession of beach-like terraces. The peak, which is 1,600 feet high, is in lat. 5° 20½′ S., long. 131° 57′ E.

THREE BROTHERS, or NUSA TELLO, ISLANDS—This group, lying 17 miles south of Kanalur, consists of three small islands at about equal distances from each other (6 or 7 miles); each island is fringed with a coral reef, which does not appear to extend far from the shore; the passages between the islands being thus free from danger.

Onelin (Oning), the north-western of the group, is low and covered with trees, in lat. 5° 37½′ S., long. 131° 53½′ E.; it is round and about half a mile in diameter.

Dol (Mangui), the north-eastern and largest, has its southern point in lat. 5° 37½′ S., long. 131° 58½′ E.; it lies N.E. ½ N. 6 miles from Ta island, and is one and a quarter miles long, and nearly one mile wide, and low.

Ta (Fadd) island, the southernmost, is round, about one mile in diameter, and 390 feet high; its south point is in lat. 5° 42′ S., long. 131° 54′ E. This island appears to be inhabited.*

TIANDU, or TIONFOLOKKER ISLANDS.—This group consists of three large and four small islands with a few outlying rocks. They lie in a N.E. by N. and S.W. by S. direction, and extend over about 20 miles in length, and about 8 miles in width. The south-westernmost island, Tam, is 550 feet high and round-backed; its southern point is in lat. 5° 47′ S., long. 132° 9′ E.

The other islands are low and flat, but covered with trees, and they can be seen at a distance of from 12 to 15 miles.

A reef extends for 3 miles southward from the two islets north-east of the high south-western island of the group; on the edge of this reef are some rocks which are always above water. No other dangers are visible, but vessels should not venture among the islands.†

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* Report of voyage of H.M.S. *Challenger*, Vol. I., p. 558.

† *Ibid.*

KÉ ISLANDS consist of the large island of Great Ké, the two smaller ones of Ké Dulan and Ruwab, and a number of islets, lying about 180 miles south-east of the Banda isles and about 70 miles from the coast of New Guinea. The islands are almost entirely formed of coralline limestone, clothed with magnificent forests which contain an abundance of fine timber trees, some of which are said to be superior to the best Indian teak. The islands are all, with the exception of Great Ké, comparatively low, and encircled by extensive shoals. The inhabitants, for the most part true Papuans, are famous boat-builders, but the islands are little cultivated, and the only trade is in coco-nut oil.

A German company erected saw-mills on Ké Dulan island, near Tuallah, in 1883.

The islands have not been surveyed, and a chart lately published by Captain Langen, of the above-mentioned German company,* differs materially from the Dutch charts published in 1884.

Great Ké, the easternmost island, is about 45 miles long N.N.E., and S.S.W., and from 3 to 6 miles broad. The whole of it is mountainous, the range traversing its centre and sloping down on either side, the peak at the north end being 2,200 feet high. The north peak is bluff and readily distinguished; its extreme, cape Borang, is in lat. 5° 16′ S., long. 133° 10′ E. On the east and west sides of the point are small bays in which huts may be seen, and probably anchorage may be found in them. Ili, a village in the north extreme of the island, is noted for its potteries of coarse ware.

The north-east point, lying S.E. ½ E. 2 miles from the north point, is low and sandy, with casuarina trees growing upon it. Off the point are two small islets, the outer one being about 40 feet high. From the north-east point the eastern coast of the island runs to the southward for 3 miles, and then receding to the westward forms a small bay, on the south point of which is the village of Ali Bandang; whence the land extends about S. by W. ½ W. to a conspicuous point in lat. 5° 34′ S., long. 133° 8′ E.

The north-west point of the island is W. by S. ½ S. 2 miles from the north point, and there is a detached rock 30 or 40 feet high off it.

The western side of the island is nearly straight in a S.S.W. direction for a considerable distance, without any conspicuous object on its shores. Ellot, in lat. 5° 42′ S, and Feer, near the south-west point of the island, are places of trade; H.N.M. brig *Pylades* in 1849 anchored off the village of Feer in 24 fathoms, at 5 cables distance from the shore.

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* *See* Royal Geographical Society's Proceedings, December 1888, page 765.

Shoals.—Various detached shoals are shown on the chart off the middle of the west coast at about 3 miles from the shore, but the only one of which there is any description is that reported by H.N.M.S. *Samarang* in 1887, as lying at 1½ miles from the shore with the north point of Ruwab bearing N. 78° W. and the western tangent of Great Ké N. 26° E.; this reef, the middle of which dries at low water, extends about 550 yards north and south, and is steep-to on all sides.

Ké Dulan island* is low, but well supplied with water and excellent timber. A shoal extends half a mile from the north point of the island, with a 2-fathom patch close outside it. Tamandam is a native village at about half a mile to the south-westward of the point, off which is anchorage in 14 fathoms, at about half a mile from the shore, sheltered from both monsoons.

Ké Dulan harbour is not readily distinguished from the north-eastward, from the similarity of the two outer islands, Rumadan and Bandan, each having a small islet off its south-east side.

There is a small summit about 200 feet high upon the south point of Obur, called Buket Krain, and another, Buket Kalamit, of about 250 feet, upon the main shore of Little Ké, S.S.W. 3½ miles from Buket Krain, which make good leading marks.

Ké Dulan, situated near the shore, at 2½ miles to the south-westward of Tamandam, is the chief town and trading place of the island, and is frequented by proas from Makassar and Banda. The roadstead is well sheltered in both monsoons, but the water is rather deep for anchorage. A jetty, built of loose coral rock, reaches from the front of the town out to the edge of the shoal water; it has a depth of 5 or 6 feet at its outer extremity at low water.

Anchorage.—The first anchorage of the *Challenger* was off the village of Tamandam, on the north point of the harbour, with Tanjong Serbat bearing E. ¾ S., Buket Krain S.S.W. ¾ W., and the east extreme of Bandan N.N.W. The second anchorage was in 19 fathoms, off Ké Dulan village, one quarter of a mile from the shore, and about a cable from the edge of the shoal water, with the mosque at Ké Dulan bearing East, Lubi rock S.W. by S., and the left extreme of Dulan Laut W. ½ S.

Margaretha harbour,† situated about 5 miles to the southward of Ké Dulan village, on the west side of Ké Dulan island, is a capacious and well-sheltered harbour, formed by Ké Dulan, Letman, and Obur islands; the best anchorage is off Tuallah village, in 7 to 11 fathoms, good holding ground.

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* *See* Admiralty Plan of Ports in the Arafura Sea; No 1,460, Ké Dulan harbour, scale, m=1 inch.

† Remarks by Captain Count Lover di Maria, H. Italian M.S. *Vettor Pisani*, 1872.

DIRECTIONS.—Vessels entering Margaretha harbour from the northward should steer in with Buket Kalamit in line with Buket Krain, bearing S.W. ¾ S., until Lubi rock bears East, whence a S. by W. course for 3½ miles will lead to the anchorage off Tuallah. The passage between the reefs is marked by buoys.

Supplies.—The forests produce timber of many different kinds, some excellent for ship-building. Coco-nut oil is the chief export. Water, pigs, and fowls may be procured at Ké Dulan in exchange for muskets, powder, hard-ware, and coarse cloth.

Tides. — One day's observations (September 25th, H.M.S. *Challenger*), at full moon, gave the time of high water, full and change, at Ké Dulan harbour at 1h. 26m. Springs rise 7 feet.

Weather.—The same report as to the winds and weather was given at Ké Dulan, as at the Arru islands.

Mr. Wallace says :— "In Timor Laut and the Ké islands, a moister "climate prevails than in Timor to the westward, the south-east "winds blowing from the Pacific ocean through Torres strait, and "as a consequence every rocky islet is clothed with verdure to its "summit."

Western channel.—H.M.S. *Challenger* passed out to the westward from Ké Dulan by a deep channel between Dulan Laut and the islands of Obur and Ut, and then between the northern point of Letman island and the Gadan islands. Between the reef off Dulan Laut island and the reef westward of Ut 9 and 10 fathoms were obtained upon what seemed to be a ledge adjoining the two reefs; westward of this the water deepened rapidly, and 90 fathoms was obtained between the north-west point of Little Ké and the islet Gadan.

Rumadan and Dura* are two low wooded islands, lying off the north-west point of Ké Dulan island. Reefs extend 5 or 6 miles to the north-westward from the former island, and an islet lies off its south point. The east end of Dura island is fronted by reefs, with 9 feet water on them at half a mile from the shore. There appear to be clear passages between all the islands of this group, though contracted in some places by reefs, which from the clearness of the water can be distinctly seen from the mast-head.

Discoloured water was reported in 1887 north of Dura island extending about one cable N.E. and S.W., on the following bearings:—Maas* S.W. ¾ W., Rumadan South, and Dura S.S.E.

Batavier reef, of coral and rock, is 6½ cables long N.E. and S.W. and 4 cables wide; the least depth obtained on it was 4½ fathoms. Its position is indicated by discoloured water; it lies with the following bearings:—cape Borang N. 80° E; Rumadan islet, S. 26° E., distant about 8 miles. About 3¾ cables northward of Batavier reef is a small shoal with a depth of 9 fathoms; between the reef and the shoal the lead gave no bottom at 20 fathoms.

Ruwab island is low and covered with trees, which are generally about 100 feet high, and are seen at a distance of 15 or 16 miles; to the north-west of Ruwab there are islands, of which little is known.

Little Tenimber islands.—On the British and Dutch charts a chain of small islands named Little Tenimber islands is shown to extend south-west from the western point of Ruwab, the farthest off being placed in lat. 6° 7′ S., long. 132° 33′ E. On a chart drawn by Captain Langen in 1886,† these islands are called Pulo Lima group (literally Five island group), and are placed 7 miles to the westward of their position on the Admiralty charts.

The ARRU ISLANDS, which lie about 70 miles west of Ké islands and 60 miles from the nearest coast of New Guinea, consist of five principal islands and numerous smaller ones, extending 100 miles north and south, and 50 miles east and west. The most important islands are Warialau, Kola, Wokan, Kobrur, Maika, and Trangan. They are separated from each other by narrow channels or *sungi*, which are only navigable for craft of very light draught. All the islands are of coralline limestone, the height nowhere exceeding 300 feet above the sea, and they are everywhere clothed with virgin forest. The inhabitants are true Papuans of various tribes, but generally inferior in physique to the Ké Papuans or the *Mafors* of Geelvink bay. Some native teachers from Amboina, established in two or three of the coast villages, have partially converted and civilized these people, but the majority of them are in a state of utter barbarism.‡

The southern and south-western coasts of the group were surveyed in 1885 by H.M.S. *Flying Fish*. From the south-west point of Trangan shoals extend to 8 miles out from the shore; outside these shoals the depth increases irregularly, and 20 fathoms will generally be found at a distance of about 20 miles from shore. The western shores of the group are fairly clean except off the north-east point of Trangan, which is bordered by a reef to 4 miles off shore. The northern islands are also fringed by reefs which extend to 2 miles out. The reefs off the eastern coasts reach very far out, and vessels should not approach these shores within 12 miles, at which distance depths of 5 to 10 fathoms over coral bottom will be found; thence the depth gradually increases, but as far as is known it does not anywhere exceed 40 fathoms between the Arru islands and New Guinea.

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* Dura or Darat and Maas are as yet not on the charts, which are incomplete.

† *See* Royal Geographical Society's Proceedings, December 1888, page 765.

‡ *Australasia*, by A. R. Wallace, 5th Edition, page 459.

The principal port in the islands is Dobbo, on the western side of Wokan island. The town of Dobbo is the great commercial centre for the trade of all the islands between Timor and New Guinea, as well as for the south-west coasts of the latter island. It is visited during the trading season, January to August, by Bugis, Ceramese, Chinese, and other traders, numbering in the height of the season to about 1,000 people. Between October and January all the smaller praus are engaged in pearl-shell and tripang fishing off the eastern coasts. The annual value of the exports, which comprise pearl-shell, tortoise-shell, tripang and birds of Paradise, is about £18,000. The Government is represented by a Dutch *posthouder* resident at Dobbo, and a commissioner from Banda, who makes a visit of a few days once a year. There is also a *posthouder* at Longa, in Workai, one of the southern islands.

Winds and Weather.—From native report, the south-east monsoon commences at the Arru islands about the beginning of May, and lasts until the end of August or middle of September; light winds then prevail to the middle or end of November, when the north-west monsoon sets in. Apparently the south-east monsoon lasts longer to the southward of the group than to the northward and land and sea breezes prevail in Dobbo in November.

The rainy season occurs in the north-west monsoon, but rain falls every day during the south-east monsoon. The finest months are September and October, when but little rain falls. In October however, during the survey of the *Flying Fish*, the land was always enveloped in thick haze, and seldom visible more than 2 miles off. In November the haze was not so thick as in October and a few clear days were experienced.

The mean temperature during the two months was 82° F.

Warialau, the northernmost island, is covered with high trees, with a village of the same name on the south-west point. A reef which partly dries extends fully one mile N.N.E. of the northern point Watele; reefs also extend eastward as far as the islet Jedan, and one mile east of Jedan there is a sand-bank which dries at low water; reefs also reach westward as far as Noba island, and to half a mile east of it.

Poba island, west of Warialau is low and narrow with a clump of trees on it; from its western point a reef projects 4 miles out.

Kola island is low and wooded; the northern point may be distinguished by two small clumps of trees which appear at a distance like hills. Buar island, to the west of this point, is bordered by a reef which stretches one mile to the westward.

Wassia island, the north-westernmost of the Arru islands, is thickly wooded; the west coast is said to be clean, with the exception of a small rocky islet off it a quarter of a mile from the shore. The north shore is bordered by a narrow reef and the east coast by a sand-bank, which at one place projects half a mile from the shore. The village is on this side of the island. The south point is rocky and a reef projects nearly half a mile from it.

There is good anchorage in the channel between Wassia and Ujia, but the depth is irregular—from 9 to 19 fathoms—sandy bottom.

Danger.—Discoloured water has been reported (in 1889) to the northward of Wassia with the western extreme of that island bearing S. 3° E. and the northern point of Noba N. 67° E.; position, lat. 5° 24½′ S., long. 134° 12½′ E. This discoloured water probably indicates the existence of some danger in the locality.

Ujia islet lies S.E. of Wassia, in a bight of the coast of the main island Wokan. The west point is fronted by a sand-bank which dries out three-quarters of a mile at low-water. A bank of 3 fathoms projects from the north point into the strait between Ujia and Wassia. The village Wiriri, formerly the principal place of trade, lies on the north-west shore. On the east side of Ujia there is a passage 2 miles wide, but it is not navigable on account of the reefs in it.

Wokan island.—The only part of this island known to Europeans is the projecting western peninsula which forms the northern side of Dobbo harbour. On the outer coast of this peninsula are the villages Wokan and Samang. The coast reef is here one-third of a mile wide, but from Malakafani, the western point of the island and the northern point of entrance to Dobbo harbour, it projects a mile to the south-west. Soundings deepen rapidly at this part; at 3 miles from the shore the depth is 20 fathoms, and at 7 miles off shore the *Challenger* found 800 fathoms.

Wamma island is roughly square-sided, and surrounded by a reef generally about half a mile wide. The north-west point, Ular, has a huge rock close to it, and on the rock a single tree, which makes a good mark for the entrance to Dobbo harbour. There are also two rocks on the reef off the west coast, the largest of these has two trees on it; behind this rock is the village Wangil. Off the north side of the island there are three rocky patches; one, of 3 fathoms, lies N.W. ½ W. 6 cables from the rock off point Ular; another, of 5½ fathoms, lies N. by E. 6 cables from the rock, and the third one lies with the same rock bearing W. ½ S., and the end of Dobbo spit E.S.E. The town of Dobbo stands on the north-east point of Wamma; a sand spit projects half a mile out from this point.

The south-eastern and south-western points of Wamma are bordered by a reef to the distance of one mile. The little islet Meinan lies 3 miles east of Wamma; as shoals extend to one mile off this islet towards Wamma, vessels using the passage between the two should keep in mid-channel, where they will find a depth of 6 fathoms. The village of Faruti, where the coal depôt was formerly kept, is situated on the east coast of Wamma.

DOBBO HARBOUR,* formed by the channel between Wamma island and the peninsula of Wokan island, affords secure anchorage in both monsoons. The entrance is 2 miles wide between points Ular in Wamma and Malakafani in Wokan, but the navigable channel is contracted to a breadth of only one mile by the shoal water extending from both shores. Within this the channel gradually narrows to a width of 4 cables off the settlement, with depths of 6 to 16 fathoms near the edges of the shoals, which show very distinctly, and are marked by poles or fishing-stakes. The central part of the channel has not been sounded out; the two shoals of 5½ and 3½ fathoms above mentioned were found in it in 1875; the passage to the north of them is safest.

The town of Dobbo, the chief resort of the traders, stands 2½ miles with the entrance of the harbour on a sandy spit projecting from the north-east point of Wamma. The native praus haul up on the east or west side of this spit according to season; the north point of it is steep-to.

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* *See* Admiralty plan of Ports in the Arafura Sea, No. 1460; Dobbo Harbour; scale, $m = 0{\cdot}95$ of an inch.

N.B.—The sketch of Dobbo Harbour does not include the village of Faruti above named.

Anchorage.—There is good anchorage in 16 fathoms with the end of the spit bearing S.S.E., and the rock off point Ular W. ½ N.; but the trading steamers anchor during the south-east monsoon close to the reef eastward of the spit, for the convenience of unloading, and during the north-west monsoon they anchor to the westward of the spit.

Supplies.—Pigs, fowls, fish and fruit are obtainable in small quantities, but no other supplies; nor can water be procured. The coin used is the Dutch dollar at 4*s.* 2*d.*, and the guilder at 1*s.* 8*d.*

Coal.—The Dutch Government have a depôt of 300 tons of English coal in a shed at the end of the spit. This coal is intended only for the use of the gunboats on the station, and can only be obtained by order of the Resident at Amboina. There are no facilities for shipping it, but praus of 1½ tons burden can be hired for 2*s.* 6*d.*a day, and coolies can be hired at a day's notice for 1*s.* a day. The price of coal is £3 2*s.* 6*d.* a ton.

Tides.—From observations obtained at Dobbo (in September) it would appear to be high water, full and change, at about 2h. 30m. Springs rise 6 feet, but the time of high water is uncertain. In the *Moluksche Archipel* it is given at 1h. 45m.

The flood stream in Dobbo harbour comes in from the westward, and the ebb stream from the eastward. In the south-east monsoon the flood is weak, but the ebb runs from one to 1½ knots an hour.

In the offing the flood stream sets to the S.S.E. and the ebb to the N.N.W.

Directions.—In approaching Dobbo Harbour from the southward, vessels usually sight the island of Babi, and when 4 or 5 miles west of it may steer a N.N.E. course for Wamma village, where a pilot may be obtained for the harbour. In approaching from the northward, the entrance is easily made out, being the third large opening south of Wassia island. When about to enter the harbour the coal shed at the end of the spit should be brought to bear S.E. by E. ½ E., and steered for on that bearing, which will lead in clear of danger.

Attention must be paid to the tides at the entrance; the flood stream setting on to the Wamma reef, and the ebb to the Wokan reef; within, the streams set in the direction of the channel.

Babi islet, midway between Wamma and Maika, is flat and thickly wooded; a reef surrounds it which is said to extend as far as

2 miles to the westward, southward, and eastward. The channels between Wamma and Babi, and between Babi and Maika, are both of them 3 miles wide and over 10 fathoms deep.

Maika island, also flat and thickly wooded, is reported by Lieutenant Phaff, of the Dutch navy, to be long and narrow, extending N.W. and S.E., and the south-eastern end to be separated from Koba island by a narrow strait only. Lieutenant Phaff also says that the strait which separates Maika from Kobrur island is known as the Koba Sungi, and that between Maika and Trangan as the Maika Sungi.* The west coast of Maika is fronted by shallow water to about 2 miles from the shore, at which distance the depth is 4½ fathoms; from thence to the westward it deepens rapidly. A coral reef covered by 1½ fathoms is said to lie 3 miles N.W. from Batu point, the north-west point of the island. The principal village stands on the south-west point; it consists of about a dozen houses, and can boast a government school. The *Flying Fish* anchored off this village in 5½ fathoms with the extremes of Maika bearing N. ½ E. and E. ½ S. In the great bay between Maika and the western peninsula of Wokan the depth is from 4 to 7 fathoms, increasing to 13 at the mouths of Wonumbai strait.

Kobrur island, south of Wokan, is separated from that island by a narrow channel, named Wonumbai strait, the western entrance of which bears E. ¼ N. from the northern point of Maika. There is a small rocky islet on the southern side of this entrance, and a reef projects half a mile out from the northern point of it. This strait is the main channel of communication for native craft between the east and west coasts, and Wonumbai village, standing on the bank of a fresh water stream which falls into the strait 3 miles within the western entrance, is the central point of trade of the interior. The strait is a quarter of a mile wide, and 4 to 5 fathoms deep in the centre as far as the village.

Trangan is the southernmost of the large islands composing the main body of the Arru group. Its northern part is flat and wooded; the trees have an even height of about 100 feet above the sea and come to an abrupt termination at the outer extremity of the north-west point, which may thus be easily recognised. The point is bordered by a reef 1½ to 2 miles wide; there is an apparent bluff standing out from the dead level of the sea, about 5 miles southward of the point, and this is the only prominent object northward of North hill.

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* Batavia Notice to Mariners, No 6, 1888.

Neiguli, where the *Flying Fish* commenced her survey, is a fishing village on the west coast, in lat. 6° 37′ S., about a mile to the northward of some large white boulders. At 2 miles S.E. of the village is North hill, a flat-topped, wooded hill, 282 feet high, the best mark for this part of the coast. There is good anchorage during the south-east monsoon in smooth water one mile off Neiguli, in 6 and 7 fathoms, sand. The flood-stream in the offing here runs to the southward, and the ebb to N.N.W., the streams turning 1½ hours after high and low water by the shore. From Neiguli the coast trends nearly S. by W. for 9 miles, and is low and thinly wooded as far as a point with a large black rock on it; it then trends S.S.E. for 3½ miles to the south-west point.

The south-west point of Trangan is a bluff point 200 feet high, with a very remarkable white square patch on it; the native name is Tanjong Bain. At 1½ miles N.N.E. of the white patch is Bain village, on a hill 226 feet high; and a range of low hills extends for 3 miles further in the same direction. Flat hill, 300 feet high and wooded, rises 3½ miles east of the white patch. This hill is the highest in Trangan and is very conspicuous from the southward, but not so from any other direction. From the south-west point the coast trends east for 3½ miles as far as the mouth of a creek, and then turning south-east, forms a bend which is 6 miles across.

The south point of Trangan consists of low sandstone cliffs 20 to 30 feet high, with casuarina trees to the height of 130 feet above the sea. Off the point is a small point, with a few tall casuarinas, and to the southward, again, is a pinnacle rock 37 feet high, named White Rock or Batu Goyang (Quaking Rock).

The south-east coast of Trangan is low, showing conspicuous red and white cliffs 30 to 60 feet high, with a few clumps of trees on them and grassy undulating hills behind. The town of Krei on this coast is the principal trading place of the southern island. The space between this coast and the islands to the eastward has not been explored; it is reported to be full of reefs.

Blackburne shoals, off the south-west point of Trangan, consist of several detached shoals of one to 3 fathoms, occasionally breaking on the shallowest parts, and having deep water between them. They extend 10 miles N.N.W. and S.S.E. with other shoals between them and the south point of Trangan. These shoals are too numerous to be described in detail; their positions and forms can best be seen by reference to the chart, and as the land is frequently obscured, and even when not so has few well defined points, no marks can be given to clear them ; they should therefore be given a wide berth. The tides are very strong here, and when running against the wind raise a considerable sea ; it is not unlikely therefore, that the shoals shift from time to time.

Though irregular, the soundings deepen towards the southward and westward, and as a rule the 20-fathom line will be found at a distance of 20 miles from the south-west point of Trangan.

Maar island, on the southern end of an extensive reef between Trangan and Workai, is well wooded and 90 feet high to the tops of the trees ; there is a sand-cay, always dry, at 1¾ miles N. by W. ¼ W. from the north point of Maar. The small wooded island Babi or Karwei lies 6 miles N.W. of Maar, and on the same reef. The space between Maar and the south point of Trangan has not been surveyed, but breakers have been seen in it, and it is reported to be full of shoals. The channel between Maar and Jei is used by praus.

Jei island, separated from Maar by a narrow channel, is 2½ miles long east and west, 126 feet high and wooded ; a narrow reef fringes the island, from which shoal water extends further still. There is a lagoon in the north-west side of the island, where the natives catch turtle. The *Flying Fish* anchored off the west side of Jei in 6 fathoms, out of the tide and swell.

Tides.—It is high water, full and change, at Jei island at 4h. 20m. ; springs rise 5 feet, neaps rise 3 feet. The streams are felt 15 to 20 miles from the coast, flood setting to the east and ebb to the west between one and two hours after high and low water by the shore. The maximum speed of the flood stream is 2 knots.

Ennu, the southernmost of the islands, is about 3 miles in length, east and west, with a narrow coral reef around it. The island is wooded and rises on its north-west side to a height of 100 feet. It is uninhabited, there being no good water on it. The south-east point is low, and ends in a spit of broken coral, off which there is a tide-race. Near the south-west point is a conspicuous group of casuarina trees ; the *Flying Fish* observation spot was on the sandy spit here ; in lat. 7° 5′ 25″ S. and long. 134° 28′ 45″ E. At 2 miles south of this point there is a shoal of 4 fathoms water, and at 5 miles west of the same point is another shoal of 3½ fathoms. Good anchorage will be found in 6 or 7 fathoms, coral, with the north extreme of Ennu bearing E. and the south-west point S. by E.

Karang island, 9 miles E.N.E. of Ennu, with depths of 7 to 10 fathoms between them, is circular, one mile in diameter, and surrounded by a coral reef which extends three-quarters of a mile to the S W. The island is low and thickly wooded, the trees showing a height of some 100 feet. On the north-west side there is a conspicuous tree, taller than the rest.

Judei island, 3 miles E. by N. from Maar, is 6 miles long east and west, covered with casuarina trees, about 150 feet high ; a clump of these standing about the middle of the island is rather remarkable, standing out as a square block. A coral reef with a dry sand-cay on it projects one mile out from the south-west point. Judei lies on the southern edge of the reef extending south of Workai, and between this reef and that north of Maar there is a channel leading towards the village of Linga, on the south point of Workai. Several wooded islets extend for 3 miles east of Judei, and then the reef turns N.N.E. as far as may be seen from the mast-head, and is steep-to. H.N.M.S. *Flores* anchored in 1888 off the north-west point of Judei in 7 fathoms, about 2 cables from the shore ; from here Affare and Longa were visited ; the channel between the reef is said to be intricate with irregular depths of 2 to 13 fathoms.

Workai.—Of this island and of all the eastern islands of the Arru group very little is known ; what follows is taken mainly from the report of Lieutenant Phaff, before referred to*:—The south-east coast of Workai is low, wooded, and fronted by a coral reef which extends 8 miles south, including the Judei islands ; this reef dries in places and apparently there is no passage through it from the eastward. In this locality are the best fishing grounds for pearl-shell and tripang. The south point of the island is a low white cliff, on the summit of which is a single tree. Under the cliff is situated the village of Longa, the residence of the Dutch *posthouder* for the southern district. Eight miles west of this point of Workai is the island Bulele, about 2 miles long east and west ; between this island and Trangan island is a passage to Maika.

The north-east coast of Workai is also bordered by a reef, which, from a long way south of the island Lilior, extends to 2 miles east of that island, and a third of a mile N.E. of the rocky islet Bambu, enclosing also four smaller islets north of Bambu. The sandy islet Kultubai rests on the southern part of this reef, and a passage near it allowed the *Flores* to approach within 2 miles of Gomo Gomo. She was then in 4 fathoms water. There is also a passage north of Bambu.

Julor (Barakan).—The north-east point of this island is rocky and densely wooded. A reef, with a small round island on it, projects fully 2 miles out from the south-east point.

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* Batavia Notice to Mariners, 1888.

Lur island is said to be divided by a shallow strait, running north and south, into two islands, of which Jambuai is the inner, and Penambulai the outer. This last is the easternmost of all the Arru islands; its outer coast is low and wooded; a reef projects more than half a mile out from the south point.

Lolla (or Lair) and Meiriri islands are thickly wooded, and are noticeable by having several light grey boulders on the sandy shore. There is anchorage off the village of Meiriri in 5 fathoms, sand, 1¼ miles off shore. The *Java* passed north of Meiriri towards the coast of Kobrur, and approached to within 3 miles of Beltan point, the north-east point of Kobrur; she was then in 2½ fathoms water.

The Karawaira islands consist of seven islands lying north and south on an extensive reef; the southernmost is a high, thickly wooded rock. The individual names of these islands are not known with sufficient certainty to be entered on the chart.

The Watelei group consist of the islands Jursian, Mantai, Duar, Mamien, Rewan, and several smaller islets and rocks, all lying upon one reef which extends from the east coast of Wokan to a distance of 3 miles east of the islands, drying in some places. There are channels in the reef, the deepest of them being 2 to 8 fathoms deep.

Wonan (Gonan) is a small wooded island with several large rocks near its north-east point; it is situated nearly opposite the eastern entrance of the channel separating Kola and Wokan islands.

The east coasts of Wokan and Kola are not laid down on the charts. The north-east point of Wokan is named Komfane point, and the south-east point of Kola, Leitin point; a large dry sand-bank lies 2 miles south-east of Leitin point. The best anchorage is off Watuli,* in Wokan, in 4½ fathoms, with the village bearing S.W. ½ S., distant 3 miles. The depth of water at 8 miles from the coast of Wokan is 7 to 8 fathoms.

SERWATTI ISLANDS include the long chain of islands which extend from the east end of Timor towards the Arru islands, and which terminate in the Tenimber or Timor Laut group. These islands may be said to be divided into two nearly parallel chains which approach each other as they near the coast of Timor. In the northern chain the principal islands are Wetta, Roma, Damma, Tau, Nila, and Serua, while the southern chain comprises Kissa, Letti,

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* Not shown on the charts.

Moa, Lakor, Sermatan, and Baba. The population of the group was estimated in 1881 at 47,000 inhabitants; of this number Roma and Damma contain each respectively 1,500, Kissa 7,000, and Sermatan 3,500.

The description of the anchorages in these islands is taken principally from the voyage of the Dutch brig of war *Dourga.* Lieutenant D. H. Kolff, 1825.*

Northern chain.—Wetta, the westernmost island, is lofty and well wooded, about 65 miles long E.N.E. and W.S.W., and 20 miles wide; the coasts are but little known and are given on the chart in dotted line. A portion, however, of the south coast, from the south-west point as far east as Tower hill, a distance of 20 miles, was, together with Babi island, examined by H.M.S. *Myrmidon* in 1886, and found to be steep-to and apparently free from dangers of any sort. Tower hill is 4,390 feet high. The east point of the island should not be approached too closely, as H.N.M. schooner *Janus* in 1840 reported breakers about 2 miles off the south-east part.

The *Dourga* anchored off Sau or Ilwaki on the south coast, in 50 fathoms water, about a cable's length from the shore, in a small bay tolerably well sheltered from the south-east winds by a point of land. The Netherlands India steamers call at Ilwaki once in three months.

Babi island, off the south-west point of Wetta, is 5½ miles in length north and south, by about 2 miles in breadth, and rises to a height of 1,415 feet. The channel between Babi and Wetta appears to be blocked by a coral reef which extends to a distance of 6 cables south of the south point of Babi, and then follows the western coast line to the northward, varying in width from one to three cables. Very good anchorage in perfectly smooth water may be had in the strength of the south-east monsoon, in 8 to 10 fathoms, a mile to the northward of the southern point of Babi. There is one village on the island, and the natives are very civil, but no supplies are procurable.

Tides.—At the above anchorage it is high water, full and change, at 1h. 30m; springs rise 8 feet. The flood stream was observed to run to N.N.W. and the ebb to S.S.E. 2½ to 3 knots, two or three days after springs.

Nautilus reef, lying one mile to the northward of Babi island, partly uncovers; no examination was made north of the reef, but apparently there is a good deal of foul ground off the north-west coast of Wetta between Babi and Honden or Dog island.*

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* The translator of Kolffs' voyage of the *Dourga* states that the name of Serwatti is probably a native of the Dutch term "Zuid-Wester" (South-wester).

Roma island lies about 28 miles east of Wetta, and is 12 miles long N.E. and S.W., by 5 or 6 miles wide, and of a good height, with smaller islands round it. On the south-west side of Roma, immediately opposite to the north end of Mita island, lies a fine and fertile valley, through which a small river runs. In the northern monsoon there is good anchorage for a vessel opposite the mouth of this river, from which abundance of wood and good water may be obtained. On all the other sides of the island the shores are steep and rocky, and beaten by a heavy surf, which renders landing extremely difficult.

The *Dourga* anchored in 7 fathoms on a sand-bank which extends half a mile to the northward of Mita islet, lying 1½ miles east of the south point of the island. The chart shows an island, Niata, 3 miles west of Roma, with a reef extending 3 miles to the northward of it; and another group of five islands about 5 miles eastward of Roma.

Damma island, about 70 miles E.N.E. of Roma, is circular, 8 miles in diameter, high and mountainous, with a smoking volcano peak 3,000 feet high on its north-east extremity. Kulewatti bay, on the eastern side,† penetrates 4 miles into the land, with great depth of water and high precipitous shores. The only anchorage is in 20 fathoms 3 cables S.W. of a ruined watch-house on the north side. Reefs fill the head of the bay, and another extends to 4 cables offshore eastward of the watch-house. Wilhelmus bay, on the north side of the island, is entirely exposed and affords very bad anchorage, a heavy sea tumbling in during both monsoons; still, the anchorage is said to be better in the south-east monsoon than that of Kulewatti. The village on its northern shore was formerly the seat of the Dutch Resident, and considered the capital of the island. The Dutch chart shows anchorage off Batu Merah (literally Red Rock), west of Wilhelmus bay, but there are no particulars to hand.

A steamer of the Netherlands India Company touches at Damma once in three months.

Two small islands on one large reef are shown on the chart to lie respectively 3½ miles S.W., and 6 miles S.W. by S. from the south point of Damma, and two other small islands appear on the chart about 13 miles W. by S. of the same point, but there is no further information about them.

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* H.M.S. *Myrmidon* 1886.

† *See* Admiralty Plan: Anchorages between Bali and Timor, No. 935; Kulewatti Harbour: scale, *m* = 1·3 inches.

Tau or Teon island, 27 miles E. by N. ½ W. from Damma, is about 4 miles in extent N.E. and S.W., and rises to a height of 2,000 feet. It is sparsely populated.

Lieutenant Kolff reports that the channel between Tau and Nila is unsafe on account of the reefs in it, but H.N.M. brig *Meermin* in 1840 only saw current rippling; until the channel has been examined caution is recommended.

Nila island, about 20 miles N.E. of Tau, rises on its eastern side to a precipitous mountain 3,898 feet high. A reef with a small islet on it extends one mile off the north-east side of Nila. On the north side there is anchorage for small vessels. The natives raise hogs, poultry, and also coco-nuts for sale at Baba and Banda.

Dusborgh reef was reported in 1870 by the Dutch brig of that name as lying about 10 miles north-west of Nila island; particulars not stated.

Griffin reef, 22 miles N.E. by E. of Nila, is of coral, and dries 6 feet, it extends three-quarters of a mile east and west, and is half a mile broad.

Serua island, about 40 miles N.E. of Nila, is a volcano rising precipitously from the sea, visible at a distance of 32 miles; the sides are too steep to afford anchorage, and the natives haul their praus up on shore. Two islets lie off the western point.

SOUTHERN CHAIN of SERWATTI ISLANDS.—East point of Timor.—Timor island itself is out of the scope of this work, but it is convenient to note here that the east point is high and the coast steep-to. A range of mountains from 2,000 to 3,000 feet high traverses the point not far from the coast in a north-east by north and south-west by south direction.

Nusa Besi, off the east point of Timor, is a small flat island appearing as a tongue of land before it opens from Timor. The island is circular, 2½ miles in diameter, and wooded, the tops of the trees being 250 feet above the sea. A coral reef fringes the island, varying in width from a few yards on the western side to about 3 cables on the north and south sides. The channel between Besi and Timor is 3 cables wide and perfectly clear, carrying 10 fathoms water right through, and is very easy for a steamer to navigate. There is excellent anchorage on the north-west side of Besi, in 8 to 12 fathoms, sand, about a quarter of a mile from the shore. The *Myrmidon* found the waters perfectly smooth here, though a heavy sea was running outside.

Kissa island, one of the most important of the Serwatti islands, lies 17 miles N.N.W. of the east point of Timor. It is about 6 miles long north and south, by 4 miles broad, and rises on the north side to a grassy peak 808 feet above the sea. The island is fertile and well cultivated, but the shores are steep and the creeks can only be entered by praus of light draught. There is anchorage during the south-east monsoon in a bight to the northward of the south-west point, on a strip of sand and rocks, with very irregular soundings in it.*

The *Nautilus* anchored in 7½ fathoms, three-quarters of a cable from the shore, with the old Dutch fort bearing N.N.E. and the south-west point S. ¾ W., and secured to the shore by a hawser. There is a village near this anchorage, but the principal village of the island, Waurili, is about 2 miles inland up a valley. There are also villages on the east coast.

Directions.—A vessel proceeding to the anchorage on the west side of Kissa island should stand in close to the south-west point of the island, and then run along shore to the northward, anchoring close round the south-west point of the bay; it would be prudent to send a boat ahead to pick up a sandy spot. The commander of the *Myrmidon* reports (1886) that this anchorage must be used with great caution, as there are patches with only 2 fathoms on them close to the outer edge of this strip, which is a solid ledge of rock, not coral.

Supplies.—Water can be procured from the beach on the west side by the old Dutch fort. The chief articles of trade are sandal wood, bees-wax, tortoise-shell, and tripang; the *Myrmidon's* officers saw cattle, sheep and fowls in considerable numbers, and fruit was procurable. A steamer of the Netherlands India Company visits the island once in three months.

Letti island, 23 miles E.N.E. of the east point of Timor, is 8 miles long east and west, and 4 miles wide. A range of hills, rising to 1,300 feet above the sea, traverses the middle of the island from east to west. The wooded sides of these hills slope gradually to the level land near the coast, where the greater portion of the inhabitants live in villages upon the more elevated and projecting points of land. The north and west sides of the island are bordered by reefs, extending about half a mile from the shore, and the east point is also bordered by a reef.

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* *See* Admiralty Plan: Ports in the Arafura Sea, No. 1460, Kissa anchorage; scale, $m = 1{\cdot}9$ inches.

The natives are not so civilized as those of Kissa, neither are they so prosperous. The produce is similar to that of Kissa.

Anchorage.—During the S.E. monsoon the best anchorage is on the north side of the island, off the village of Serwaru, where the fringe reef is only 1½ cables wide, and the depth increases though not regularly, from 5 fathoms at the edge of the reef to 25 fathoms at half a mile from the shore.* In 1836 the *Nautilus* anchored here in 11 fathoms, rocky bottom, with the church of Serwaru bearing S.S.E, and Tutoke village on the north point of Letti E.S.E. Very small vessels can avail themselves of an opening in the reef off Tombra, a village lying one mile S.W. of Serwaru; this opening is 150 yards wide and 6 to 9 fathoms deep; the reef on either side is exposed at low water. The *Dourga* warped in here, and moored head and stern to the rocks. During the N.W. monsoon the best anchorage is said to be off the village Batumeau on the N.E. coast, but information is wanting as to this anchorage.

Moa island, 4 miles east of Letti, is about 18 miles long east and west, and is for the most part of coral formation and flat, only in the north-east part mount Karbau (Buffalo) rises to a solitary peak 4,100 feet above the sea. Reefs extend from the N.E. and S.W. points. There is anchorage on the side in the channel between Moa and Lakor but nowhere else around the coast. The channel between Moa and Letti is said to be safe, but it has not been explored. The cattle, with which Moa island abounds, are considered the best in these islands; Moa also produces goats, pigs, and fowls.

Lakor island, separated from the south-east coast of Moa by a narrow strait, consists of hard coral rock raised about 20 feet above the sea, and covered with wild shrubs, with here and there patches of cultivations and coco-nut trees on the sandy spots. Water is scarce and most of the necessaries of life are imported from other islands. The population is small and poor. The *Dourga* anchored abreast of the western of two villages on the north side of the island, in 7 fathoms and moored to the shore reef by a hawser; the shore is very steep-to, and the anchorage insecure.

Ukanao islets and reef.—Little is known of these islets which are shown on the chart as lying on an extensive reef 10 miles east of Lakor, the reef extending 15 miles north and south, and being 8 miles wide at its northern part. The southern islet, Brisbane, was reported by the steamer *Brisbane* (which struck on the reef off it in

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* *See* Admiralty plan of Anchorages in the Arafura Sea; No 1460; Letti anchorage; scale, $m = 1{\cdot}88$ inches.

January 1880) to be 2 miles long north-west and south-east, and covered with trees 30 feet high, with the reef projecting from the south-east end for 1½ miles. When the *Brisbane* was on the reef the N.W. point of Luan island bore N. 50° E., Maria island N. 63° E., and the S. point of Sermatan N. 83° E.[*] The south-east end of the reef bore from the ship S. 15° E. 3 miles, and the reef extended towards the north and west as far as could be seen from aloft.

Tides.—The *Brisbane* gives as time of high water 11h., and the rise of tide 6 feet. The flood stream sets to the west and the ebb to the east; only one low water was observed in 24 hours; the wind at the time was W.N.W. blowing fresh.

Luan island, about 26 miles to the eastward of Lakor is 14 miles in circumference, and, being high, is visible at a considerable distance; it is surrounded by an extensive reef studded with islets. Within this reef there is a depth of 2 fathoms, affording anchorage for small vessels, but it is not known if there is anchorage for large vessels in the vicinity. Luan is the only inhabited island of the group. The products are chiefly turtle-shell and tripang. Kalapa islets lie about 4 miles E.N.E. of Luan; close outside of these the reef is steep-to

Sermatan island, next to the eastward of Luan, is about 15 miles long, and is composed of a high range of hills, extending east and west, the sides of which slope steeply down to the sea. As this island is thinly inhabited and at the same time affords no shelter to shipping, it is unimportant to strangers. Its people carry on trade with Luan.

BABA ISLAND, about 45 miles E.N.E. of Sermatan is 15 miles long north and south, mountainous to a height of 3,000 feet above the sea, and covered with forests. There are several smaller islands near it, that most worthy of notice being Wetan, which lies off the west coast. The north-east side and the south-east side of the island are inhabited, the central portion being left unoccupied by natives. The western side of Baba is so precipitous and overgrown with forest that cultivation has extended but little; the small village of Tepa is the capital of the western tribe who have also plantations on the neighbouring island of Wetan.

Wetan island is more fertile and better cultivated than Baba; it is 6 miles in extent N.N.W. and S.S.E., and rises to a height of 900 feet at the northern end, and 1,160 feet at the southern extremity, the intermediate land being low. A reef projects from the S.W. point of Wetan, and the south part of the channel between Wetan and Baba is foul.

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[*] These cross-bearings put the ship in lat. 8° 22′ S, long. 128° 24′ E.; but by observation the ship was in lat. 8° 22′ S, long. 128° 30′ E.

Shoals.—The commander of H.N.M.S. *Flores* reported in 1888 that a reef extended from the south-east point of Baba for 3 miles in an E.S.Easterly direction. A shoal, position doubtful, is placed on the chart 3 miles west of the south-west point of Baba.

The other islands near Baba have few inhabitants, and are seldom visited. Dai, 13 miles north of Baba, is 4 miles in length and rises to a height of 2,375 feet; Dawalur and Dawera, which lie 10 N.E. of Baba, appear to be connected by a reef, and together extend 8 miles N.W. by W. and S.E. by E.; both are high. Masela, 8 miles S.E. of Baba, is 6 miles in length and 839 feet high.

Anchorage.—During the south-east monsoon, the best anchorage is abreast of the village of Tepa, on the west side of Baba island, where a vessel may lie securely in 16 fathoms, though great caution will be required in beating up to the anchorage, as the wind frequently comes off the high land in sudden squalls. In 1885 the commander of H.N.M.S. *Merapi* reported the existence of a coral reef of 2 fathoms water in Tepa road with the N.W. point of Baba bearing N. by W. and the flagstaff at Tepa S.E. ¼ E.

During the north-west monsoon it is said that the best anchorage is under Wetan island, there being a bank of 5 to 10 fathoms between it and Baba on which a vessel may anchor sheltered from east and west winds. There is also anchorage on the east side of Baba, with the north-east point of the island bearing with the south point S. by W, and the entrance of a fresh-water stream S.W.; but the bottom is generally foul about this island.

Supplies.—Cattle, pigs, goats, and other provisions can be procured at Tepa. The Dutch government have a small depôt of coal there for the use of the gunboats. The Netherlands India steamers call at Tepa once in three months.

TENIMBER ISLANDS.—This group the easternmost of those which extend from Timor towards the Arru islands, consists of several thickly-populated islands, of which Yamdena, or Timor Laut (literally "Seaward Timor") is the principal; they are almost all formed of coral apparently recently raised above the sea,* without harbour or shelter for shipping, and with the exception of the outlying islands Vordate, Laibobar, Selu, and Sera, are low. The inhabitants, who were estimated to number 25,000 in 1881, are a mixture of Malayan and Papuan races and are industrious cultivators and fishermen. Water is scarce and brackish, and probably from this cause fever is very prevalent. The islands Vordate, Larat, and Sera are visited by traders; the remainder of the group is almost unknown.

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* "A Naturalist's Wanderings in the Eastern Archipelago" by H. S. Forbes, 1885. Mr. Forbes spent three months in the village of Ritabel on Larat, making natural history collections.

Yamdena or Timor Laut is 65 miles long, N.E. by N. and about 20 miles wide in the middle. The west coast is low and fronted by islets and reefs only partially explored. The east coast is formed by a range of densely-wooded hills 600 to 800 feet high. It is indented by deep bays which appear inaccessible on account of a reef which fringes the whole coast. The villages are built on the cliffs overhanging the sea, and are most difficult to approach.

Oliliet,* one of these villages built on a cliff 413 feet high, about 12 miles from the S.E. point of Yamdena, was visited in 1839 by Captain Owen Stanley in H.M.S. *Britomart.* The cliff is nearly perpendicular, and can only be ascended from seaward by a flight of steps cut in the hill-side. Anchorage can be had during the N.W. monsoon in 6 to 11 fathoms water at from 1½ to 2 cables south of the point on which the village stands, but it is quite exposed to the east. Pigs, and poultry appeared plentiful at the time of the *Britomart's* visit, the natives, however, were not very willing to part with the stock. Water could be procured on the beach, but a merchant vessel should be cautious in sending her boats for it as the natives have a reputation for treachery on account of the murder of the crew of the schooner *Stedman* in 1823, whilst watering at Laura, a similar village 4 miles north of Oliliet.

Merapi reef, lying 6 miles off the east coast of Timor Laut, is 3 miles long N.N.W. and S.S.E. and one mile wide; it consists of rock, and dries in parts at low water. From it the east point of Timor Laut bears N.N.W. ½ W., and the southernmost part of the high land to the north of Laura S.W. by W. ½ W.

Garnusa reef lies 6 miles northward of Merapi reef, and is about 2 miles in diameter, an islet and some rocks above water lie upon the reef. The channel between these reefs and the coast of Timor Laut is said to be foul.

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* *See* Admiralty plan, Anchorages in Arafura Sea, No. 1,460 Oliliet anchorage; cale, *m* = 1 inch.

An islet lies 2 miles off the east point of Timor Laut, and a reef 2 miles N.E. of the same point.

Larat island is separated from the north end of Timor Laut by the narrow Wallace channel, which is only fit for boats. The island is 15 miles in length E.S.E. and W.N.W., its south-west and south-east sides being bordered by reef extending one mile out. There are three villages on its northern shore, and off the centre one there is anchorage about 6 miles from the west point. A Dutch official resides at the village of Ritabel on the Larat shore of Wallace channel. A steamer of the Netherlands India Company touches at Larat once in three months.

Vordate island, separated from Larat by a navigable channel one mile wide, is 8 miles in length N.N.E. and S.S.W. Like Larat it is high and well wooded, but the hills are more distinct. Its shores are lined with reefs and rocks, and 2 miles off its south-eastern shore lies Schildpad reef which runs parallel to the shore for 3 miles. The island is well cultivated, and is the centre of commerce of the Tenimber group, but great caution must be exercised when dealing with the natives, although many of them profess Christianity, having been converted by the Dutch missionaries. H.M.S. *Britomart* anchored off the southern end of the island in 1839, but the bottom was very uneven. There is anchorage on the north-west side during the S.E. monsoon for a small vessel in 18½ fathoms, sand, off the village Sobiani at 3 cables from the shore, and near the reef. Fresh water may be obtained here with caution. In the N.W. monsoon the native traders anchor within the N.W. entrance of the strait between Vordate and Larat.

Molu island, the northern island of the Tenimber group, is about 7 miles in length N. and S., with an islet and reef off its northern side. There is anchorage off the village of Adodo near the north-west point. Between its south point and the northern coast of Timor Laut are several islands, the channels between which do not appear to be safe. Vessels approaching Vordate from the westward must part northward of Molu.

ISLANDS OFF the WEST COAST of TIMOR LAUT.—Laibobar rises in a symmetrical peak about 2,000 feet high. Selu island, 35 miles S.W. of Laibobar, is the highest of the group; the chart shows a reef extending 3 miles out from its north-west point. But little is known of Nuswotar, Wariari, and the other islands between Laibobar and Selu—they are reported to be low and surrounded by reefs.

Sera island, the southernmost of the chain of islands off the N.W. coast of Timor Laut, is about 10 miles in extent, elevated, and well cultivated. On its northern side is the village of Wailulu, the residence of a native chief appointed by the Dutch. Reefs, extend off the north and west coasts, and for 4 miles off the south-west point with several islets and rocks on them.

Bara Sadi reef, with only 4 feet water over coral, lies 8 miles S.W. by W. ½ W. from the S.W. point of Sera, with the west extreme of Selu island bearing N. ¾ E. About 3 miles southward of this reef, depths of 7½ to 10 fathoms, coral bottom, were obtained, and a bank with 5½ fathoms least water over it lies 4 miles E.S.E. of Bara Sadi reef.

Watergeus reef, with 3¾ fathoms over it, lies about midway between the south-west points of Sera and Selu, with the west extreme of Sera bearing S.E., and Sekelur islet off the north-west point of Sera E. ⅞ N.*

Discoloured water.—In 1880 the commander of H.N.M.S. *Madura* reported the existence of discoloured water with an estimated depth of 7 to 8 fathoms in lat. 7° 59′ S., long. 130° 42½′ E.

Egeron strait, separating Selaru from Timor Laut, is from 5 to 6 miles in width, but its navigation is rendered somewhat intricate by the islands surrounded by reefs, which lie in the entrances, narrowing the channels to one or 1½ miles in width, with depths of 9 to 30 fathoms.

Selaru, the southernmost of the Tenimber islands, and separated from Timor Laut by Egeron strait, is 24 miles long N.E. and S.W. Little is known of its coasts. The south point is low, and fronted by a dangerous reef, projecting more than one mile from it, requiring great caution when in its proximity during the night, particularly as the currents are variable and strong at times. The land about the point is covered with trees, and the shore about one mile eastwards presents a rocky face, the east end of which appears to form the entrance of a river; it is remarkable by a large detached fragment of rock resembling the hull of a ship. A small wooded islet is shown on the chart 1½ miles W.N.W. of the point.† The north coast is also bordered by a reef, and westward of the north-east point is a deep bay, in which the chart shows depths of 8 to 9 fathoms.

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* The charts of this region must be followed with caution, as the Dutch chart, on which the Admiralty chart is based, differs considerably from the map of H. O. Forbes.

† Horsburgh, Vol. II p. 698, 8th Edition.

A wooded islet lies westward of Selaru; it is 2 miles long N.N.E. and S.S.W., two thirds of a mile wide, and 150 feet high. Position, lat. 8° 19′ S., long. 130° 41′ E.

Myrmidon bank with 9 fathoms over it, and deep water around at a distance of 7 cables, lies about 6 miles S.W. ½ W. from the above mentioned island in lat. 8° 23′ S., long. 130° 27′ E.; a depth of 16 fathoms, sand and coral, was obtained about 4 miles southward of this bank.*

For the Arafura Sea and the approaches to Port Darwin, *See* chapter XIV.

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* As the longitude of the south-west point of Selaru is not accurately determined, it is doubtful how far Myrmidon bank is from that island. *See* Notice to Mariners No 62, 1889.

CHAPTER XIII.

ISLANDS OFF THE NORTH-WEST PENINSULA OF NEW GUINEA; NORTH-WEST AND WEST COASTS OF NEW GUINEA.

Variation in 1890.

Waigiu island	- 2° 10′ East.	Cape Valsche	- 3° 00′ East.

The north-western and western coasts of New Guinea are comparatively little known, being out of the ordinary track of ships, and seldom visited by European vessels for trade. Native praus from Makassar visit the coasts annually, and barter European goods for wild nutmegs, pearl shell, tripang, &c. The western part of New Guinea, westward of long. 141° E., is included in the Dutch residency of Ternate.

Much of our knowledge of the west coast was first derived from the voyages of Kolff in 1826, Lieut. Modera in 1828, and Captain D'Urville in 1839. More recently examinations of some parts have been made by various Dutch officers; the Italian explorers D'Albertis, O. Beccari, G. E. Cerruti, and Captain Conte Lovera di Maria, commanding the Italian corvette *Vettor Pisani*, and the officers of the German cruizer *Gazelle*. All these authorities have been referred to for the following description. A descriptive historical sketch of the people of Western and North Western New Guinea will be found in "La Papouasie," par Docteur Cte. Meyners D'Estrey, 1881.

The north coast of Waigiu was examined by Forrest in 1775. D'Entrecasteaux's expedition in 1793, and D'Urville's expedition in 1828. The south coast by Dr. A. R. Wallace in 1860, and by the yacht *Marchesa* in 1883.

Winds and weather.—On the West coast of New Guinea, the south-east monsoon lasts from April to October, and the north-west monsoon for the remainder of the year, with sometimes variable winds between N.N.W. and N.E. in January. In the spring the weather is often changeable; in March, April, and May, storms and squalls are experienced, and heavy rains from June to September. From October to May the weather is serene and fine.*

ISLANDS NORTH of NEW GUINEA.—Lord North island, Helen and Carteret reefs, as well as the other islands between New Guinea and the Pelew islands are described in Pacific islands, Vol. I. (Western groups).

Asia islands† are three low, flat islets occupying a space 4 miles in length N.E. and S.W. A reef extends about one mile north-east of the northern islet.

Position.—Northern islet, latitude 1° 3′ N., longitude 131° 17′ E.

Aiu or **Yowl islands,** lying north of Waigiu, consist of about 20 small islands surrounded by reefs, covering on the chart an extent of 28 miles N.N.E. and S.S.W., by 13 to 15 miles across. The southern and central islands were visited by Captain Forrest in 1775, and were described by him as being five in number, stretching about 13 miles east and west. The largest of them, Aiu Baba, is 3 miles long, 500 feet high. It is inhabited; its reef extends 3 miles to the southward and 6 miles to the south-westward. Abdon and Konibar islets are about 200 feet high. The northern islands are laid down by Captain Forrest from native accounts; they are reported to be low and wooded. The channel between these islands and the Asia islets has been traversed by many vessels; no dangers have been discovered in it. Budd, or Florentia islet, first seen by D'Urville in 1828, is low and wooded; it is placed on the chart 17 miles W.N.W. of Aiu Baba.

The Siang and Wiang islands have been described in Chapter XI.

BOUGAINVILLE STRAIT.—This strait, between Riub island, of the Wiang group, and cape Forrest, the north-west point of Waigiu, was first traversed by M. Bougainville in 1768, and since then by the exploring expeditions in 1793 and 1823–1827. The available width of the channel is reduced to 3 miles by rocky islets lying south and south-east of Riub; there are no known dangers in the strait, except the reef off cape Forrest, and a bank in the south-west entrance of the strait, on which the *Recherche* struck 5 fathoms, but which has not been further examined. Vessels should pass south of the rocky islets off Riub, and may pass either north or south of Shaggy rocks.

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* Navigation of Indian ocean, China and Australian seas, Captain Becher, R.N., 3rd edition, p. 68.

† *See* Admiralty chart:—Eastern Archipelago. Eastern portion, No. 942 B; scale, $d = 2{\cdot}75$ inches.

The currents in the strait are reported to be strong, but information is wanting as to their set.

WAIGIU ISLAND is 65 miles in length, east and west, with 25 miles greatest width, and is nearly divided into two by an inlet on the south side. The island is hilly and uneven; but there are no very high mountains, the highest peak, Buffaloes Horn, being estimated by the officers of the *Coquille* at 1,516 feet. The north coast shows hard crystalline rocks, but the south coast is mostly of coral limestone, fissured and worn into many fantastic shapes. The whole island is clothed with dense forest. The climate is hot and moist. The inhabitants appear to be immigrants from New Guinea, Gillolo, and the surrounding islands, mixed in various degrees. The language spoken is that of north-west New Guinea. Sago is the chief food, rice is unknown.

The northern coast of Waigiu was explored by Captain Forrest in 1775; it is described as generally bold; but reefs extend from some points and islands near the shore. There are several sheltered harbours on the coast where fresh water can be obtained.

Cape Forrest is the north-west point of Waigiu; two detached reefs lie off the point, which should not be approached within 2 miles.

Piapis harbour* is situated about 2 miles eastward of cape Forrest. The entrance is about half a mile wide, and has depths of 20 and 30 fathoms in it. Foul ground extends half a mile out from the eastern entrance point, which can be avoided by keeping on the western side, where there is a haycock-shaped rock 15 feet high, with 10 fathoms depth, muddy bottom, close to it. Within, the harbour divides into two arms, penetrating about 1½ miles to the southward. Hill islet, on which there is a pool of fresh water, lies in the centre of the western arm. Anchorage can be had between this islet and the western entrance point in 15 to 25 fathoms, mud. At the head of the eastern arm there is a small brook of water, and here good timber for masts may be obtained.

Shoe islet lies off the coast about 20 miles east of cape Forrest; and the Buttons islets extend 4 miles N.N.W. of Shoe islet; it is not known if there are any dangers about these islets. Arago bay, eastward of Shoe islet, is about 2 miles wide, and contains several islets.

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* *See* Admiralty plan of anchorages in Islands off North-west part of New-Guinea, No. 912, Piapis harbour; scale, $m = 1{\cdot}96$ inches.

Ports Duperrey and **D'Urville** are situated on the west and east sides respectively of a narrow peninsula about 13 miles east of Shoe islet. Both ports are small circular bays, rather more than a quarter of a mile in diameter, with soundings of 10 to 20 fathoms, sand or coral, excepting near the shores, where the water is very shoal in some parts. Both are open to northerly winds. There is a brook of fresh water on the south shore of port Duperrey, and several streams run into port D'Urville.

Offak harbour[*] (Taktak bay on Dutch chart), is about 30 miles eastward of cape Forrest, bounded by high land, and not easily discerned from the offing. On the east side of the entrance stands a sugar-loaf hill, about 500 feet high, and inland there is a conical peak, Buffaloes Horn, which is in line with the Sugar loaf, bearing S.S.W. The entrance of the harbour is about a quarter of a mile wide in the narrowest part, and 20 to 30 fathoms deep, with one patch of 9 fathoms in mid-channel.[†] The eastern side of the entrance is bordered by a reef to a distance of one cable, and several rocky islets named Offing islands lie just outside; beyond these, at a distance of 4 cables N.N.W. of the eastern point, lies a shoal covered by 2 feet of water; the Lélède rocks, also rocky islets like haycocks, lie on the eastern side of the channel entrance. The western side is clear.

Within, the harbour extends 2 miles to the westward, and 3 to the eastward, with depths of 20 to 30 fathoms. To the southward, fronting the entrance, is Repos island, connected with the shore by a reef which also extends 2 cables west of the island, forming an inner port, Jacquinot bay, where the depth is 12 to 20 fathoms, muddy bottom. There is a pool of fresh water on the island. Just to the east of the eastern point of entrance is a small cove with 8 to 22 fathoms depth, in which the *Coquille* anchored; a stream of fresh water enters the cove.

Cape Freycinet, the northernmost point of Waigiu, stands 3½ miles east of the entrance to Offak harbour, and is high.

Manuaran island, 11 miles east of Offak harbour, is of moderate height, and has some islets off its western side; the channel between the island and the shore is 2 miles wide, with irregular depths of 9 to 20 fathoms.

Shoals.—A shoal,[‡] covered by less than 6 feet of water, is shown on the chart 4 miles E.N.E. of Manuaran island. Another bank* of 4½ fathoms, but on which there may perhaps be less, is shown as lying 7 miles east of Manuaran and 3 miles off the Waigiu coast.

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[*] *See* Admiralty plan of anchorages in Islands off North-west part of New Guinea, No. 912, Offak harbour; scale, *m* = 1·8 inches.

[†] U.S. Hydrographic Notice, No. 54 of 1877.

[‡] Named d'Entrecasteaux bank in the French Instructions Nautiques.

Lawak island and **bay.**†—Lawak island lies 3½ miles S.E. of Manuaran island, and is separated from the coast by a navigable channel about 1½ cables wide between the reefs, and 6 to 9 fathoms deep. Upon the north side of the island there is a remarkable hill. The eastern point of the island projects in a long peninsula, steep-to, called the Dolphin's Nose. Lawak bay is on the east side of the island between the Dolphin's Nose and the coast of Waigiu, and has depths of 17 fathoms, decreasing to 10 within two detached reefs lying a quarter of a mile from the island. A ship may be tolerably sheltered here, but the bay is open to the eastward: there is also anchorage in 7 to 9 fathoms S.S.E. of the south point of Lawak, sheltered from all winds except those from the north-east. Water may be obtained from two streams on the Waigiu shore.

Kabarei bay,† open to the north-west, is situated one mile south-east of Lawak. Its entrance is about one mile in width, with depths of 11 to 16 fathoms, decreasing to 7 and 5 fathoms near the reefs and within. In its south-west part is Saouni harbour, formed within some islets and reefs, where small vessels find anchorage in 2 or 3 fathoms, near the village. Water can be obtained in the east part of the bay.

Boni harbour,‡ about 5 miles east of Kabarei bay, is formed by a bend in the coast, fronted by Boni island and the reef which extends 2 miles north and one mile east of that island. The northern entrance, between the Boni reef and the narrow fringe reef of the Waigiu coast, is 2¼ cables wide, with depths of 11 fathoms in mid-channel. Anchorage can be had in 7 fathoms, mud, just within the entrance, or in 13 to 20 fathoms coral, about a mile farther in, off the mouth of a stream on the Waigiu coast, west of Boni island. The eastern entrance, between the Boni reef and the islet Bombédari, 1½ miles south-east of Boni, is 3 cables wide and 12 to 30 fathoms deep; but few soundings have been taken in it, and the limits of the reefs on each side are not well defined.

The French ships *Recherche* and *Esperance* during the search for

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* Named Uranie bank in the French Instructions Nautiques.

† *See* Admiralty plan of anchorages in the islands of North-west part of New Guinea, No. 912, Lawak and Kabarei bay; scale, $m = 1{\cdot}86$ inches.

‡ *See* Admiralty plan of anchorages on the N.W. coast of New Guinea. No. 1416. Boni harbour; scale, $m = 1{\cdot}96$ inches.

La Peruse, spent a fortnight at Boni anchorage in August 1793 ; their crews being afflicted with scurvy. Good water was obtained from a stream on the Waigiu shore, south of Boni island, and the natives supplied the ships with turtle, pigs, fowls, sago, and fruit.

The islet Bombédari, above mentioned, is connected with the shore to the eastward by a long narrow reef ; between this reef and the coast there are depths of 11 fathoms, mud, probably affording sheltered anchorage, but the place has not been closely examined.

Tides.—According to observations at Boni anchorage by the French ships, it is high water full and change at 5 hours, rise of tide 6 feet. The tidal stream ran with a velocity of half a mile an hour ; direction not stated.

EAST COAST of WAIGIU.—From Boni harbour the coast trends E.S.E. for 11 miles to cape Lamarche, and then S. by E. for 12 miles to Ume or Pigot point, the south-east point of the island, which is of moderate height. Between the two points the shore is bordered by a wide reef, probably connected with Buccleugh shoal. Two small wooded islets named Waison and Wayam lie 4 miles S.S.W. of Pigot point.

Buccleugh shoal lies E.N.E. of Pigot point and extends 5 miles to the eastward as far as is known, but this shoal has not been examined. On the western end there is as little as 2 fathoms water, perhaps less. In 1877 the U.S.S. *Alert* passed between this shoal and Waigiu island, and observed rocky heads that in many places approached the surface ; this passage is therefore not recommended for a sailing vessel. However, 8 fathoms was the least depth obtained by the *Alert*; the water was very clear, and the bottom was seen nearly the whole distance between the shoal and Pigot point.*

The SOUTH COAST of WAIGIU is fronted by several detached shoals and islands, and is but little known.

Grosvenor reef, covered by 9 feet of water over sand and rock, and no bottom with 60 fathoms close to, lies about 6 miles south-east of Pottopau point, but its exact position is not determined; when the *Grosvenor* had Wayam island bearing E. by N., and the east point of Battanta island S. by W. the shoal bore N.N.E. about 3 miles.

Bombay bank is a dry sand bank to which two positions are assigned on the chart: one S. by W. one mile from Wayam Island, and the other 4 miles further S.W. by W.*

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* U. S. Hydrographic Notice, No. 54 of 1877.

Kabiai gulf or Waigiu sea extends in a north-western direction across Waigiu island to within 2 miles of the western arm of Offak harbour, nearly cutting through the island. At its northern extremity there is a safe harbour, named port Blosseville by the officers of the *Coquille*, who examined it from Offak harbour. The gulf has not been explored, but it can be approached with safety by keeping Pottopau, the western entrance point, on a N. by W. ¾ W. bearing, until King William island is in line with the two points of the coast south-west of the entrance; when the course must be altered to N.E. by N. for the anchorage off Momos, which lies to the eastward of an islet with a tree on it.†

Momos (Waibakul).—The population of the town is principally Malay. A few supplies, such as goats or fowls, may be obtained here, but are not plentiful. Good water may be had from the stream westward of the village. Momos is visited by a Netherland vessel of war annually. There is anchorage in 10 fathoms with Tree islet bearing N.W. by W. ½ W., and Bluff point E. ¾ N.

Kapiboi is a large village, the residence of the Rajah of this part, about 16 miles westward of the entrance of Kabiai gulf. There is a channel close along the shore from Kabiai gulf, inside the banks, but a careful look-out is required from the mast-head. A vessel should pass northward of Little Saonek island, and anchor in Kapiboi bay in 13 fathoms, mud, with Little Saonek island bearing N.W. by W.‡

Gamen island appears as part of the south coast of Waigiu, being separated from it only by narrow channels leading into an extensive unexplored bay. It is 15 miles in length, east and west, and composed of raised coral; the southern shores consist of limestone cliffs, underworn by the action of the sea.

In 1877 the U.S.S. *Alert* anchored in 20 fathoms near the western entrance of a large bay on the south side of Gamen island. From a partial examination of the bay 4 to 10 fathoms were found in the entrance, within which are several coral reefs having deep water between. There are numerous villages on the shores of the bay.

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* Horsburgh gives the following description, *see* Vol. II., 2nd edition, p. 623:—The *Bombay*, Captain A. Hamilton, saw a dry bank about one or 1½ miles distant from the Waigiu shore, and when it bore N. ½ W., cape Spencer or Foul point bore S. ½ E., and the east point of Battanta S.W. ¼ S. This sand bank is in a transit line with a round knob like an island bearing N. by W. ¼ W., and it is in transit line with the west end of the island off Point Pigot bearing N. by E.

† Lieut. R. F. Powell, R.N., yacht *Marchesa*, 1885.

‡ Ibid.

WEST COAST of WAIGIU.—Nothing is known of this coast, which is indented north of Gamen island by a wide bay fronted by several islands. The Batangapilli islands are the outermost of this islands.

DAMPIER STRAIT, also named **GAMEN STRAIT,** separating Battanta island from Waigiu, takes its first name from the great English navigator who explored it. It is 65 miles long from cape Mabo, the west point of Battanta, to cape Pigot, the south-east point of Waigiu ; but the narrower and difficult part of the strait northward of Battanta, is only 30 miles long. The soundings are in general deep and irregular, the bottom gravel, with coral and shells in some places.

This strait has not been surveyed ; the islands and reefs in it have been laid down from various authorities, and their positions can only be considered approximate.

Winds.—In general the winds are variable in Dampier strait, but in December and January sudden squalls from N. and N.W. are experienced in its northern part, with heavy rain and a great swell from the south.

Tides.—Systematic observations as to the tides are wanting ; it appears from such observations as have been recorded that it is high water at full and change about 6 hours ; springs rise 10 to 12 feet. The flood stream sets to W.S.W., and the ebb to E.N.E., but the streams appear to be greatly affected by the prevailing monsoons.

In the height of the north-west monsoon, in the narrow part of the strait, between Pigeon and Foul islands, the ebb at springs runs between 4 and 5 miles to the E.N.E. for 6 or 8 hours, and between one and 3 miles at neaps. The flood sets south west for 3 or 4 hours, but is weak. During the height of the south-east monsoon, in this part the flood sets west for 8 or 10 consecutive hours, turning successively W.S.W., S.W., and S.W. by S. ; it then attains its greatest velocity, which at springs sometimes exceeds 5 miles an hour. and at neaps 4 miles. The ebb at this season runs E.N.E. or N.E., and is neither strong nor of long duration.*

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* Captain Becher, R.N. Navigation of the Indian Ocean, China and Australian Seas.

The Tameai islands, or **Jef-fam islands,** lying off the western entrance of Dampier strait, form a large group of low islands, entirely unexplored, and a berth of at least 4 miles should be given in passing south-east of them, as in 1877 a line of coral reefs was seen from the *Alert* lying parallel with their south-east side, with apparently deep water between.

King William islands or **Mios Mansuar** is about 7 miles long, E.N.E. and W.S.W., and high, being visible at a distance of 35 miles; when first seen in coming from the eastward three hills on it appear like separate islands. The shores are steep and in most parts are covered by trees; on the eastern extremity there is a white patch; on the north side there is deep water at a quarter of a mile from the shore. Hump island, with a round rocky islet a short distance outside it, lies off the east end of the island. The passage between King William island and Gamen is much obstructed by coral reefs, which extend in patches across the entire channel, with depths of 20 to 50 fathoms between them.*

Augusta and Pigeon islands are two small, low wooded islands, lying 3 or 4 miles south of King William island, and forming the north side of the narrowest part of Dampier strait. They are surrounded by reefs with intricate channels between them, and vessels are recommended not to attempt to pass between them and King William island. A chain of coral patches appears to extend 3 miles from Augusta island in a south-west direction. The coral reef on the south side of Pigeon island, with only 3 or 4 feet of water on it, projects about half a cable's length, and then the water deepens fast to 5 and 10 fathoms.

Anchorage.—The U.S.S. *Alert* anchored in 10 fathoms, coral, with 6 to 10 fathoms around, southward of the opening between Augusta and Pigeon islands. There is a bank extending eastward for 4 or 5 miles from Pigeon island with moderate depths on it for anchorage, the bottom being mostly sand and gravel. On this bank 1½ miles E. by N. of the island there is 5½ fathoms, coral, deepening to 10 and 12 fathoms, sand, when 3 or 4 miles eastward of Pigeon island.†

The *Alert* anchored on the 8-fathom patch near Foul island, and found it to be a shoal of considerable extent, having depths of 4 to 9 fathoms; from the centre of this shoal the west end of King

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* U.S. Hydrographic Notice; No. 54 of 1877.

† U.S. Sailing directions for the Indian Ocean, &c., No. 85, p. 299.

William island bore W. by N. ½ N.; the opening between Pigeon and Augusta islands W. by S., and Foul island S. ¾ E.*

Danger.—The *Sophia Fraser* grounded on a coral reef that lies 6 miles E. by N. of Pigeon island; it is of small extent and has deep water close to the edge which dries. When aground the western extremity of King William island bore N.W. by W. ¼ W.; Pigeon island just visible, well open of the above; Hump island N. by E. ½ E.; and Foul island S.S.E.†

Woodford Shoals are several rocky patches on which the *Woodford* and other vessels have struck, lying S.W. by W. of King William island; three patches are shown on the chart: one lies 6 miles W. by S. of Augusta; another 9 miles W.S.W. of the same island; and the outer patch of 4 fathoms, 11 miles W.S.W.; but there are probably many other shoals between King William island and the Tameai islands, as that region has not been examined.

Battanta island lies on the south side of Dampier strait, and is separated from Salwatti island by Pitt strait. It is about 35 miles long E. by N. and W. by S., and high, being visible at a distance of 30 miles. Fisher island, a small high islet, lies 2 miles W. ½ N. from Cape Mabo, the western point of Battanta.

Vansittart bank is the shoal water extending north of Battanta, and forming the south side of Dampier strait; its edge is almost steep-to. It gradually increases in breadth from each extremity of the island, its northern part being 6 miles distant and embracing Vuil or Foul island, which lies 8 miles E.S.E. of Pigeon island. The safe channel is here only 3 to 4 miles in width. Mansfield island, 5 miles east of Foul island, is a bank of white sand, with a clump of high trees on it on the edge of the bank, and within it are numerous islets, scarcely distinguishable, being so near the shore.

Battanta reef extends 9 miles E. by N. from Evanas point, the eastern point of Battanta, and has depths of 2 fathoms near its outer extremity, but it has not been examined. The *Marchesa* crossed the ridge connecting Battanta reef with Vansittart shoal, and found depths of 10 fathoms with the south-east point of Battanta just open of Evanas point. Westward of this line the water appeared to be very shoal.

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* U.S. Hydrographic Notices, No. 54 of 1877. It would appear from these bearings that the relative position of the islands, as represented in the latest charts is very much in error.

† Nautical Mag. Vol. 33, p. 42. It will be noticed that the bearings given do not agree on the present chart.

Marchesa bay,[*] so named from the yacht which first explored it in October, 1883, is formed between the two eastern peninsulas of Battanta, the land around being elevated 300 to 1,000 feet. In its entrance, which is 2 miles wide, lies Anam island, about 600 feet high; the safe channel passes north of it. Thence, the channel extends 3 miles to the west, terminating in Paradise harbour. South of the parallel of Anam island the bay appears to be full of reefs, but north of this the channel seems clear of dangers, no bottom being found at 10 fathoms up to the entrance of Paradise harbour, which has not been examined. A reef extends 3½ cables east of Scarf point, the south point of the harbour, and midway between this point and Toe point, to the north, there is anchorage in 13 fathoms. Mangrove harbour, within Toe point, is 2 cables wide, with depths of 10 fathoms, mud.

Directions.—In approaching Dampier strait from the westward, care must be taken to give the Tameai islands a berth of at least 4 miles, but the west end of Battanta may be approached, it is believed, with safety. When cape Mabo bears south, a course should be steered to keep within 3 to 5 miles of the north coast of Battanta in order to avoid the Woodford shoals, till Augusta island bears N. by E., when Mansfield island will be seen in line with the south point of Foul island. The course must then be altered more to the northward to avoid the edge of the Vansittart bank, observing not to approach Foul island nearer than 5 or 6 miles while it bears east, nor within 3 miles of it. When past Foul island, the water becomes very deep to the eastward.

Thence a course should be laid to pass south of the dangers lying off Waigiu, keeping over towards Pigot point, if the wind be from the northward, to avoid being driven on to the New Guinea coast by the swell from the north. Great attention must be paid to the set of the currents.

In approaching from the eastward, point Pigot should be made out, giving a good berth to Buccleugh shoal, which may be avoided by keeping Wayam island to the westward of W.S.W.; then proceed, reversing the directions given above.[†]

PITT or SAGUIEN STRAIT, between Battanta and Salwatti islands, is about 34 miles in length between the west point of Salwatti island and the eastern extremity of Battanta reef, and is from 3 to

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[*] *See* Admiralty plan of anchorages in the islands off north-west part of New Guinea, No. 912, Marchesa bay; scale $m = 1{\cdot}38$ inches.

[†] Becher, Navigation of the Indian Ocean, &c. 3rd edition, p. 194. Findlay, Indian Archipelago. 3rd edition, p. 862.

5 miles in width. The Salwatti shore is in general high and steep-to; the Battanta shore is also safe nearly throughout, except in some places where it is bordered by rocks to a distance of a quarter of a mile; but there are frequent calms in the strait on account of the high land on each side, and the rapid tides are attended with strong eddies by which vessels are rendered unmanageable and subject to serious dangers; this strait should never be taken, therefore, by sailing vessels.

South coast of Battanta.—Fisher island and cape Mabo have already been described; at 2 miles east of cape Mabo there is a reef between two small islets near the shore. About 12 miles east of cape Mabo there is a bay with a depth of 45 fathoms, black sand, at half a mile from the shore. The *Marchesa* found good anchorage in 17 fathoms in a bay protected by a reef extending half-way across from its eastern point, with Saguien island bearing S.W. ¾ W. Marchesa bay, and Battanta reef have been described, page .

SALWATTI ISLAND is but little known. Near the north-west point of the island there is a small island, Saguien, to the eastward of which there is a bank with soundings of 30 to 65 fathoms over it very near the shore where vessels have found temporary anchorage. At 15 miles eastward of Saguien the shore is so steep-to that vessels can go alongside the island without finding anchorage. Brown coal was found by the *Gazelle* at West harbour on the east side of Salwatti.*

Snapan island, off the north-east extremity of Salwatti, is high and surrounded by a narrow reef; an islet lies west of Snapan, close-to, and a detached reef lies half a mile E. by N. from the north point of Snapan. Several islands lie east and south-east of Snapan, and Havick reef, reported in 1880, with 2 fathoms water over it, lies 5 miles E. by N. of Snapan.

Samatti, near the north-east extremity of Salwatti, is a large town where a few supplies can be obtained. There is anchorage in 7 fathoms about 2½ miles from the shore, with Ram rock bearing W. ¾ S., Kampong point S. ½ E., and White rock E. by N. There is also anchorage in 4 fathoms nearer the shore, but a pilot is necessary to reach it.

Directions.—In approaching Samatti from the westward, pass northward of Snapan island at a distance of half a mile, and steer for a white rock (which opens of Snapan island on a S.E. by E. bearing) on a S.E. ½ S. course, until Ram rock (which opens of Sunapan or Jackson island when bearing S.E. by S.) bears S.S.W., then south for Kampong point (east of the village). This latter course leads clear of a dangerous shoal in the bay. As there is no chart with which these directions may be compared, caution is necessary in making use of them.* Ram rock must not be steered for on a course eastward of south, as two reefs were seen by the commander of the *Java* between Snapan island and the reef north of Ram rock.†

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* Annalen der Hydrographie, 1876, p. 225.

The west coast of Salwatti is little known; the chart shows a reef with several islands on it 8 miles off shore, extending 12 miles north and south, with soundings of 7 to 11 fathoms near it.

Broken islands is a cluster of islets lying south of the above reef, and 5 miles from the south-west shore of Salwatti.

Salewo and **Galewo** are two islands shown on the Dutch chart (on which the English chart is based) as lying 4 miles from the southwest coast of Salwatti, and west of the entrance to Selé strait. On the chart of Signor Cerruti, and also on that of the *Gazelle* which differs considerably from the Dutch chart of this locality, only one island, Salewo, is shown. A group of islets were seen 7 or 8 miles W.S.W. of Salewo, which were supposed to be Broken islands.‡

SELÉ or **KABOBOLOL STRAIT**§, formerly known as Galewo strait, separating Salwatti island from New Guinea, was first traversed by Captain Watson in the *Revenge* in 1764. It was examined by Lieut. McCluer, who went through it with the *Panther* and *Endeavour*; and still more recently by Signor Cerruti in the yacht *Alexandra*, in 1870; by the Italian corvette *Vettor Pisani*, in 1872; and the German war-vessel *Gazelle*, which passed through it, in June, 1875, piloted by her steam-launch. Much of the following information is due to Capt. V. Schleinitz, of the *Gazelle*, who states that this strait is preferable for steamers to either Pitt or Dampier straits, the currents, which take the direction of the strait, being weak; and good anchorage is to be found in it.

English or **Selé point,** the western point of New Guinea, and the southern point of entrance of Selé strait, is low and covered with bushes, but behind are ranges of hills 1,000 to 2,000 feet high. Reefs extend about 4 miles south of the point, and a few cables west of it, but on the north side it appears to have deep water close-to. About 3 miles S.E. of it are the two Orse islets surrounded by a reef. Breakers were observed by the *Gazelle* south of English point as far as Orse islands.

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* Lieut. H. Powell, R.N. yacht *Marchesa*, 1883.

† Hague Notice to Mariners, No. 5 of 1888.

‡ Annalen Hydrog., Berlin, 1876; p. 225, with a chart. Cosmos di guido Cora, 1873; p. 150, with a chart. Cosmos di guido Cora 1875; p. 107, with a chart.

§ *See* Admiralty plan, No. 1416, Selé strait; scale, *m* = 0·36 of an inch.

Entrance islet lies 1¼ miles N.W. of English point, the channel being between them. Breakers were observed between Entrance and Salewo islands and the group of islands northward of them.* Entrance island is uneven or rugged, but Salewo is undulating and both form good marks for the entrance.

Directions.—In approaching Selé strait from the southward the depths will be found to vary from 7 to 20 fathoms changing sometimes more than 4 fathoms between two casts of the lead ; caution must therefore be exercised as shoaler water may exist, and the water is not clear enough for dangers to be visible. The best course is to steer for Salewo island, which can hardly be mistaken for any other island, until English point bears N.E. by E., distant about 2½ miles, and then steer N.E. by N. into the strait with Entrance island half a point on the port bow. After Entrance island is passed the south-east point of Salwatti island should be kept a little on the port bow, and passed at a distance of half a mile. The south-western part of the strait from English point for a distance of 12 miles forms a wide, deep, and clear channel, for which no particular directions are needed, except that Delfzyl island should be kept on the starboard side ; beyond that island the strait contracts to a narrow passage, and then opens out immediately again to a wide area filled with islands and reefs, among which there are navigable channels.

If it is intended to pass through the strait without anchoring :— from the narrow part of the strait a north-east course for 2 miles will lead past First Passage island, (on which there was a tall tree in 1875) which should be passed at a distance of a ship's length from its western side, in order to avoid a sunken reef which lies one cable N.W. of it. This course N.E. should then be continued for 2 miles until a small, high, island—Second Passage island—bears N. by E. ; then a course of N. by E. ¼ E. for about 13 miles will lead past the east sides of Second Passage island (which should be kept close-to in order to avoid a reef to the westward) and Third Passage island. These passed, the course lies between Watson island on the east, and, on the west the shoal water extending south-eastward of Sand island along the coast of Warir island, the depth here being 4 to 5 fathoms, which is the shallowest part of the passage. From thence a course N. $\frac{1}{3}$ E. leads eastward of Wedge island, and between the long, low, Seeland island and Exit island into the eastern part of Dampier strait.

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* These islands behind are reported to be much nearer to Salewo and Entrance islands than shown on the chart of 1889.

Anchorage.—On emerging into the wider area from the southward, a channel will be seen to the north-west between a large and a smaller island; this channel, by keeping the large island on the starboard hand leads to West harbour, where there is very good anchorage in 10 to 12 fathoms, mud, between Vivien island and the Salwatti shore. On the opposite side of the strait similar anchorage may be found in East harbour, but there is only a depth of 4 to 5 fathoms in the entrance, which is immediately north of three small islets, and between them and a larger one. When the three small islets are passed, the soundings will increase to 7 fathoms, in which a vessel may anchor. A village stands on an islet east of this harbour near the New Guinea coast. The coast consists of limestone, covered with dense wood, and fringed by mangrove swamps.

Tides.—In West harbour, one high, and one low water, each of eight hours' duration, were observed in the 24 hours, succeeded by one high, and one low water of four hours' duration; there are, therefore, two establishments of 3h. 15m. and 11h. 30m. (approximately). The flood stream sets to the southward, from 1 to 2 knots an hour, and ebb to the northward, not quite so strong.

The strongest stream occurred during the eight-hour tide, and the feebler during the four-hour tide. The highest high water occurred after the four-hour flood, and the lowest low water after the four-hour ebb. These remarkable phenomena were attributed to the meeting of the tidal waves of two oceans, the northern being the more potent.*

In the broader parts of Selé strait the tidal streams were less strong and took the direction of the strait.

Winds.—In June, the prevailing winds in Selé strait were south-east, force 1 to 4, and south-west with a force of 3 to 6. The weather, with the exception of a few rainy days, was fine.

Cape Spencer or Foul point of the Dutch chart, the north-east point of entrance to Selé strait, is of moderate height; reefs project to a distance of 1½ or 2 miles from the point, as well as from Dom islet, which lies off it.

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* Captain von Schleinitz, June 1875.

NORTH COAST of NEW GUINEA.—From cape Spencer the coast trends about E.N.E. to Cape of Good Hope, the northern point of New Guinea; it is in general high, but in some places is low near the shore. A short distance inland a chain of mountains from 4,000 to 5,000 feet high, and covered with trees, ranges parallel with the coast as far as the north-west part of the great Geelvink bay.

Threshold point, 13 miles E.N.E. of cape Spencer, is the western point of a high peninsula which forms the west side of Threshold bay. The western part of this large bay is filled with reefs, but the eastern half appears to be clear. On the north side of the steep east point of the bay are two small cascades of fresh water. H.M.S. *Basilisk* found a depth of 26 fathoms, mud, in the entrance, with High point bearing W. by S. and Low islet S.E. The village is ruled for the Dutch by the representatives of the Rajah of Salwatti.

From Threshold bay eastward there are soundings of 20 to 60 fathoms in many places within one or two miles of the shore, but from Brebes and Sedaria points reefs project to a distance of 2 miles.

Mios Sayu or Mispalu islands are two small low islands lying north-west and south-east of each other—each surrounded by a reef; they are separated by a channel about a mile wide, with a depth of 35 fathoms.* The outer island, Amsterdam, lies about 4 miles from the New Guinea coast. The depth of water between the inner island, Middleberg, and the coast is 8 to 10 fathoms, and vessels can anchor S.S.W. of the island. There are soundings of 15 to 40 fathoms, sandy bottom, at 3 to 4 miles off the coast between Middleberg and cape of Good Hope, affording anchorage in case of necessity.

Cape of Good Hope or Kain Kain Beba, 16 miles east of the Mios Sayu islands, is the northern extremity of New Guinea; it is whitish in colour, low, bare, and steep-to. False cape, or Tuft point, 10 miles to the eastward of cape of Good Hope, is liable to be mistaken for it. From this point the coast trends about E. by S. ½ S. for 95 miles to cape Mamori, the West point of Geelvink bay, with several indentations in it. Little Geelvink bay, or Mansein, 25 miles west of cape Mamori, and 10 miles east of a remarkable conical hill near the shore, affords anchorage in 12 fathoms; there are rocks on each side of the entrance. A fresh water river enters the head of the bay.

Geelvink bay, with the islands in it, are described with the coast to the eastward in Pacific Islands Directory, Vol. I.

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* Belcher. Voyage of H.M.S. *Sulphur*.

CURRENT.—On the north-west coast of New Guinea upon the equator and in about longitude 132° East, a set to the northward of 4¾ miles an hour was experienced for 10 consecutive hours. Eastward of this position to Dampier island and Astrolabe bay the current was found setting to the westward in the month of May from 12 to 48 miles a day.

WINDS and WEATHER.—After clearing Dampier island on the 19th May, light easterly winds and heavy rain squalls were experienced almost continually during the run along the north coast of New Guinea. The wind in the early morning was frequently baffling, but at eight or nine a.m. it generally settled in an easterly direction.

WEST COAST of NEW GUINEA.—From English point, the western point of New Guinea, the coast trends S.E. by E. ½ E. for 95 miles to McCluer inlet; little is known of it beyond such particulars as are given on the chart, and these cannot be said to be trustworthy. The coast is low, fronted by several islands and detached banks, and must be approached with caution. The native name of this district is Nottan.

Islands between Misol and New Guinea.—Off the north coast of Misol there are several islets which extend across the channel between that island and Salwatti, leaving, however, a clear passage north of them towards Pitt strait. The Vienna and Nosela islands lie north of the north point of Misol, and between these and Salwatti is a group named Schildpad or Turtle islands, surrounded by reefs, with two small islands south of them named Vetter Pisani. All this region is quite unexplored.

Hesketh shoal was sailed over by the English yacht *Goshawk* in 1875. From the shoal part where bottom was seen, and the depth 2¾ fathoms obtained, Schildpad north island, the largest and highest of the group, bore N. by E. ½ E., distant 5 or 6 miles; the next cast of the lead gave 5 fathoms, and shortly afterwards, no bottom at 17 fathoms.

Pinon island (West Brother) is a strip of coral sand, about 500 yards long, in a south-east direction, by about 150 yards broad, covered with high trees and vegetation, and surrounded by a semicircular coral reef, open to the north-west.

With south-easterly winds, good anchorage is found at the open side of the coral reef which partially surrounds the island, in about 14 fathoms, the middle of Pinon island bearing S.E. The depth decreases gradually towards the island to 10 fathoms, and then suddenly shoals to 2 and 3 fathoms.*

False Pisangs and Seven islands.—The False Pisangs appear on the Dutch chart as the easternmost of a range of islands and scattered rocks extending eastwards for about 55 miles from the south point of Misol. It is probable that safe channels exist between these islands, but they have not been explored. The *Gazelle*, in 1875, passed at a distance of 10 miles from the chartered position of the False Pisangs, but they were not seen, while the Seven islands, about 12 miles to the N.W., were visible when passed at a greater distance. These groups are therefore probably incorrectly placed on the chart.

Sabuda island and Pisang islets.—Sabuda island is moderately high, with undulating contours, and wooded. The Pisang islets are lower, with less even contours, and appear from the southward as three large hilly islets, and a few small rocks, the whole covered with vegetation.

McCLUER inlet, so named after Lieut. McCluer, who sailed up it in 1791, is known as Telok Berau by the natives. It is an extensive gulf which reaches to within 12 or 13 miles of the Geelvink bay, thus almost insulating the north-west part of New Guinea. Its southern shores, including the small bays and anchorages on its west part, were examined by the officers of the German war-vessel *Gazelle*, in 1875, and by Mr. Hartog of the Dutch steamer *Egeron* in 1877. The following description is taken from the report of the *Gazelle*.†

The north shore of McCluer inlet was not examined by the officers of the *Gazelle*; it appears to consist of low land covered with mangroves, with a range of hills about 300 feet in height behind it; a second range, of from 1,600 to 2,000 feet in altitude, being situated farther back. All the islands, as well as the coast of McCluer inlet, consist of limestone formation, the surface of which is just sufficiently decayed to favour a luxurious vegetation.

Soundings.—Close to the south side of the entrance the soundings are from 30 to 49 fathoms, but further northward the depths vary between 15 and 25 fathoms. Caution should be used in approaching the shoal parts of the coast of McCluer inlet, as mud banks, having from 2 to 3 fathoms, extend from the shore in many places. In the vicinity of the 2 to 4 fathom bank, about 23 miles eastward of Oger island, there are depths of 3 fathoms, at 3 miles from the coast.

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* Annalen der Hydrographie, 1876, p. 225.

† Annalen der Hydrographie, 1876, p.p. 1–8 and 220–230, with a chart; Annales Hydrographiques, 1876, pp. 556, 573; Journal of the R. G. Society, 1878, pp. 294–301.

Tatingar point is the western extremity of Three Capes peninsula on the south side of McCluer inlet. The peninsula takes its name from its terminating to the westward in three capes much resembling each other, the central and highest one being elevated 650 feet. Behind the point the wooded land rises to an elevation of 1,640 feet, and thence a chain of hills about 2,000 feet high extends to the eastward.

Wass islet, lying close off the village of Atti Atti, at 4½ miles north-eastward of Tatingar point, is rocky and covered with bushes, and vessels must pass north of it. Vessels can anchor in 20 fathoms, sand, on its west side, with the north point bearing between N.E. by E. ½ E., and E.N.E., protected from the south-east winds; also off the centre of the east side, in 15 fathoms, protected from south-west winds.

Patippi bay*.—From Wass islet the coast trends 14 miles E. by N. with several small indentations, and forming the south side of Patippi bay, which is about 7 miles in extent by 4 miles in greatest width, sheltered on its northern side by the steep Breusing peninsula, rising to a height of 330 feet. The entrance is 1½ miles wide, and the depths within are from 7 to 10 fathoms, affording anchorage protected from all winds. A few islets lie off the shore, which is thinly inhabited by peaceful natives.

Islands off cape Salikiti and Segaar bay.—From cape Salikiti, the north-west extreme of the peninsula, the limestone coast trends 12 miles eastward to Segaar bay, and has two small wooded islets off it, with deep water near the shore. Off Segaar bay a chain of wooded islands and islets extends for a distance of 10 miles parallel with the coast. West island consists of one large and a few small islets, and south-east of these are the numerous Surega islets. Oger island, the largest of the chain, follows next; the channel separating it from the shore is encumbered with islets, but a passage, with depths of 12 to 17 fathoms, passes close along the east side of the island, between it and East island, into Segaar bay. East islands consist of one island and numerous islets, with depths of over 7 fathoms between them and the shore. Large vessels can anchor off a village in a bay on the south side of East island, sheltered from westerly winds.

Segaar bay*, which extends about 3 miles inland, terminating in a brackish rivulet, is sheltered from the northward by the above described chain of islands and islets, and there are several islets within the bay. Entrance peninsula, on the west side, hides the bay from seaward, and on approaching it will be easy to recognise by its bluff points, 60 to 80 feet high, with some islets close off it. A 4-fathom bank extends from the south shore to the middle of the entrance, with anchorage off its extremity in 5 to 7 fathoms, sheltered from all but W.N.W. winds. The shores of Segaar bay are densely wooded, and there are several villages, generally built on piles 6 to 7 feet above the level of the water. Completely sheltered anchorage will be found in *Gazelle harbour*, the bight on the south-east side of Entrance peninsula, which can be approached by passing west of the shoal, and within 1½ cables of the peninsula, in depths of 5 to 8 fathoms. When past the shoal, steer with caution towards the village of Sisir, on an islet on the south side of the harbour, and anchor in 4¾ to 5¼ fathoms, mud, good holding ground, with the south point of the peninsula bearing between N. and N.W. by N., and the village between S.W. and S.W. by W. On the opposite side of the bay is a smaller bight.

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* *See* Admiralty plan, No. 1416; Segaar bay, scale, $m = 0{\cdot}73$ of an inch.

The steamers of the Netherlands India Company, from Banda and Gisser, touch at Segaar bay once in 3 months. The bay is also frequented by Malay praus and Chinese traders.

Tides.—It is high water, full and change, in Segaar bay at about 6h. 30m. (approximate). Rise and fall of tide, from 4 to 6 feet. The flood and ebb streams run, from a half, to one knot an hour. In McCluer inlet the streams follow the direction of the coast.

South coast of McCluer inlet.—From Segaar bay the south coast of McCluer inlet trends east for 11 miles, with several villages on it, and deep water close-to. It is steep and about 400 feet high; and inland the hills rise to a height of 1,300 to 2,000 feet. Here the coast turns to the south-east, and then to the north-eastward for a distance of 45 miles, the shore becoming low, and bordered by extensive banks of mud, which must be approached with caution. An extensive bank lies from 8 to 12 miles off this coast, with depths of 2 to 4 fathoms on it, and 4 to 10 fathoms between it and the shore bank. The northern part of this coast is formed of low mangrove land, with numerous brackish creeks.

Jeschke river.—The head of McCluer inlet opens out into an inner inlet about 20 miles long, east and west, and 12 miles wide, with low shores intersected by numerous creeks, and fronted by extensive banks of mud, with depths of 5 to 20 fathoms between them. On the south side there are two deep indentations, probably the mouths of rivers.

Jeschke river,* probably the same as Jakati, which enters the head of the gulf or inlet, is 4 to 5 fathoms deep at the mouth; the lower reach can be followed up in an easterly direction for about 5 miles, when two branches of the river will be seen, one to the N.N.E., the other to the S.S.E., both of them navigable beyond the junction. To enter:—Mount Credner, a hill on the north side of the river, about 330 feet high, should be steered for on an E.N.E. course until the mouth of the river bears E.; the course may then be altered direct for the mouth.

COAST.—Between Three Capes peninsula and cape Sapei, which lies S.E. ¼ S., 55 miles from the former, the coast forms a wide bight, in which are lesser bays fronted by islands; in appearance it is rugged and cliffy, but it has not been examined. The native name for this district is Onin.

Gide island, situated near the southern cape Batu Mafutiri, may easily be mistaken for that cape, as on coming from the southward it does not appear separated from the mainland. The contours of the island are more broken than those of the peninsula, and it is not so high.

Alexandra and Freshwater bays, which lie immediately of Batu Mafutiri, were examined by Signor Cerruti and Captain Di Lenna in 1870. They are each about 3 miles wide, and are separated by a thickly wooded peninsula, on the east side of which the *Alexandra* anchored opposite a cascade of fresh water. In Di Lenna's map the depth of water at the anchorage is 2½ to 5 fathoms, and in the middle of the anchorage there is a shoal about a third of a mile from the shore. In the middle of the bay there is a depth of 40 fathoms.†

Sekru and Kapau are trading villages of some importance, about 12 miles east of Batu Mafutiri; the chief export is wild nutmegs. Information is wanted about the anchorage. A steamer of the Netherlands India Steam Ship Company calls here once in three months, and anchors about a mile from the shore. Panjang island lies in front of Kapau bay; the eastern point of the island is bordered by a reef.

Danger.—A shoal, having less than 6 feet of water over it, is shown on the chart as lying 7 miles south of Panjang island.

Patimuni point, 23 miles south-east of Kapau, is high; the chart shows it to be bordered by a reef, and also shows a patch with less than one fathom over it 3 miles west of the point.*

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* So named after an officer of the *Gazelle* who examined it.

† Cosmos de Guido Cora, 1873, with a map.

Charles Albert Archipelago is the name given to the islands near Patimuni point. Semai, the northernmost, lies 4 miles north-west of the point; it is 6 miles long north-west and south-east, and hilly. Karas Kani lies south of the point; it is 8 miles long N.W. and S.E. and 1,200 feet high, with a hill at each end. To the east of it are two smaller islands and an islet, with depths of 25 and 42 fathoms between them and Karas Kani.

Cape Sapei or Baik is the north-west point of Orange Nassau peninsula (Kumawa). From Cape *Sapei* the coast trends S.E. by S. ½ S. for 28 miles to Cape Kaffura, the south-west point of the peninsular; the land between them reaches a height of 3,000 to 4,000 feet near the shore, but the peaks are usually hidden in clouds. The islands Katumi, Vulcan, and others, lie near the shore midway between the two capes. The schooner *Sireen* in 1832 found no bottom at 100 fathoms, 4 miles from the shore, near these islands.†

Cape Kaffura is a high bold headland composed of limestone. Ruloff islands are three small high islets lying 4 miles east by south of the cape. Discoloured water was seen by the *Sireen* in 1832, with cape Kaffura bearing N.W. ¼ W. and the point to the eastward north-east.

Adi island, 26 miles east of cape Kaffura, is 26 miles long W.N.W. and E.S.E.; it is of coral formation, and only 50 feet high in the centre; several shoals and sunken reefs lie north-east of Adi to a distance of 5 miles from the shore, and, according to Cerruti, a bank of 2½ fathoms lies west of the north point of Adi, but its position is doubtful. About 5 miles south-east of the western point there is a small bay affording anchorage in 10 to 11 fathoms. Tumbu Tumbu, or Bird islet, lies 5 miles south of Adi; reefs project north-westward and south-eastward of this islet.

Nautilus strait, separating Adi island from the shore, is 5 miles in width, with depths of 8 to 10 fathoms in it. Between the north point of Adi and Urobie islet the channel is only about 2 miles in width.

Kamrau bay (Arguni) is an extensive indentation in the coast north of Adi island. The coast of this bay is also indented with numerous smaller bays, and near its centre lie two small islets,

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* According to Findlay, 3rd edition, p. 848, this patch has 3 fathoms over it.

† The *Sireen* gave the name of cape Van de Bosch to this peninsula.

Karawata and Kaliwata, with a sunken rock midway between them and depths of 15 to 45 fathoms around. Reefs appear to extend for 4 or 5 miles off the western shore with some islets on them, and in the northern part of the bay are several other islets. The river Karufa, which is 100 yards wide at the mouth, debouches on the western shore ; there is anchorage off the mouth, but caution is required to avoid the shoals. This river was examined by the boats of the *Etna.**

At the head of Kamrau bay a narrow passage gives access to a basin about 5 miles in diameter, and from this basin another narrow channel leads north into a large sheet of water, named on the chart Arguni bay ; these bays were also examined by the boats of the *Etna.*†

Uru Languru or Triton bay is an inlet extending 9 miles to the north-east into the mainland, having two islands on the north side of the entrance, and several islets farther in. The shores are mountainous. A chain of five small islands stretches west of the west point of Aiduma, and the fair channel lies between the outermost of these and Semieuw islands, 3 miles to the north. Fort du Bus, a Dutch establishment, was situated at the head of a small cove on the north side of Triton bay, but was abandoned in 1835. The cove is 2 miles deep to the north-west, and one mile wide, having at the entrance a depth of 32 fathoms, which decreases to 5 fathoms, mud, at its head, where a vessel may moor one cable's length from the shore. The channel into the cove is close to the south-west side, as a mud-bank, nearly dry at low water, extends from the north-east side, three-fourths of the width of the cove.‡

Tides.—It is high water, full and change, in the cove in Triton bay at 1h. 8m. ; rise and fall 7 feet ; the greatest rise and fall is at the quarters, when the range is nearly 8 feet. There are two high and two low tides in the 24 hours.

Aiduma island, on the eastern side of the entrance to Uru Languru, is 9 miles long W.N.W. and E.S.E. ; from the western point, as stated above, a chain of islets extends 5 miles to the westward. There is anchorage in a bight on the north-east side of Aiduma, in 25 fathoms, at a cable's length from the shore, and opposite a fertile valley, in which there is a native village.

Iris strait (Saraweri), the channel by which the schooner *Iris* entered Uru Languru bay, is between Aiduma island to the south and Dramai island, and the mainland of New Guinea to the north. The strait is, generally speaking, from one to 2 miles wide, but is contracted to less at both ends. The *Iris* had no soundings in mid-channel with 70 fathoms of line.

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* La Papouasie or Nouvelle Guinée Occidentale, par le Docteur G. Meyners D'Estrey. This work gives a description of the people on the banks of the river.

† *Ibid.*

‡ This bay was visited by Dumont D'Urville in 1839.

Kayu Mera island, 6 miles east of Aiduma, is 1,600 feet high.*

Kiruru bay (Etna) has its entrance between Cape Bohia (Perier) and Cape Baudin, 8 miles to the north-west. A reef extends 2 or 3 miles westward of Cape Bohia, and to the northward of this is the small island named Lakahia, also surrounded by a reef. The bay first trends 10 miles to the north-east, and then turns sharply to the eastward for 15 miles. There are depths of 10 to 15 fathoms in the entrance, within which it becomes narrow, a shoal extending 3 miles from the eastern shore. The district, including Kiruru and Uru Languru, is known as Kowai.

Vlakke point†—From the southern point of Kiruru bay the coast trends about E.S.E. for 41 miles to Vlakke point, a steep foreland visible at a distance of 30 miles; the *Dourga* in 1828 obtained soundings of 38 and 40 fathoms at 4 miles from the point. This district is known as Kapia. A high range of mountains, named Charles Louis mountains by D'Urville, traverses this part of New Guinea east and west for a distance of 180 miles; its most western peak being mount Lakahia, 4,564 feet high, near the coast 29 miles north-west of Vlakke point.

Coast.—From Vlakke point the coast trends E. by S. for 81 miles as far as Cape Steenboom, and throughout that length is low and densely wooded, presenting from the sea a monotonously uniform appearance, relieved only occasionally here and there by gaps, probably indicating the mouths of rivers.‡ As far as is known of this part of the coast it is not dangerous, except at cape Steenboom, which is fringed by a reef to a distance of 3 miles.

The Utanata river, which enters the sea 13 miles north-west of cape Steenboom, is about 2 miles wide at its mouth, and is fronted by a bar on which there is 6 feet at low water; within the bar there are depths of 4 to 7 fathoms to a distance of 8 miles up the river. A very heavy sea breaks on the bar during the south-east monsoon; during north-west monsoon trading prahus from Ceram visit the river exchanging rice and cloth for *masoi*.[*] The best anchorage is about 3 miles to the westward of the mouth of the river in 6 to 8 fathoms, mud; this position is more secure during the south-east monsoon than in the opposite season, as the coast supplies partial shelter; but with a persistent south-east wind a heavy swell sets in.[†] The Wamuka river, a similar but smaller river, enters the sea 4 miles to the north-west of the Utanata, and is, like this latter, fronted by a bar.

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* Findlay, Indian Archipelago, 3rd edition, p. 847.

† In the *Moluksche Archipel*, and in Horsburgh Vlakke point is named Buru point.

‡ Dumont D'Urville, 1839.

Tides.—The range of the tides off the mouth of the Utanata is 7 to 9 feet; the flood stream sets to the E.S.E. and the ebb to W.N.W.; the streams are, however, irregular, and are influenced by the current out of the river.[‡]

Pisang bay, to the eastward of cape Steenboom, is fronted by several shoals, the outermost of which lies E. by S. 10 miles from the cape. Two large rivers debouch on the southern shore of the bay; they are of considerable size, but are fronted by sand-banks on which, during the south-east monsoon, there is a heavy surf. A vessel can anchor in 13 fathoms off the bar of the southern river, but a swell from the southward and the banks which lie to the north-west render this anchorage unsafe in the south-east monsoon.

Coast.—From Pisang bay the coast trends E.S.E. for 80 miles, and then E.S.E. for 115 miles as far as the northern entrance to Dourga strait; throughout the whole of this distance the coast is low and richly wooded; no high land whatever can be seen from a vessel south of latitude 5° S. The mud-shore is so shelving that vessels cannot approach it within 4 to 8 miles; it can be approached nearest about lat. 6° 15′ S. where there is a village which was visited by Captain Cook in September 1770. The district eastward of Utanata was said by the people of Utanata to be named Timakawa or Timoraka.

Two banks are shown on the chart; the one 10 miles E.S.E. of the large river above mentioned, and 4 miles off shore, the other 20 miles E.S.E. of the river and 8 miles off shore. The north-west and south-east monsoons prevail along this coast with some modifications as to their direction; the south-east monsoon being the rainy season and the north-west monsoon the fine season. The *Triton*, when at anchor at various places during four days in May 1828, found currents setting alternately towards north-east and south-west with a velocity of 2 miles an hour—but whether these were flood and ebb, or ebb and flood streams respectively, is not stated. The rise and fall was 10 to 13 feet.*

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[*] A fragrant bark, *cortex oninus*.

[†] A description of the people of this locality is given in La Paponasie or Nouvelle guinée occidentale, par le Docteur G. Meyners D'Estrey. Since the visit of the *Triton* and *Iris* in June, 1828, no European vessel has visited this river.

[‡] *Moluksche Archipel.*, p. 256.

Providential bank lies approximately in lat. 5° 38′ S., long. 137° 55′ E., its outer edge being about 18 miles from the main shore. The depth of least water over it is unknown,—4 fathoms was struck on it, there being 6 to 9 fathoms immediately south of it, and 12 fathoms 2 miles to the westward.

Triton bank lies in lat. 6° 0′ N., long. 138° 4′ E., its outer edge being about 23 miles off shore; 4 fathoms was struck on it, and there is 10 fathoms, mud, immediately south of it. The *Dourga*, in 1826, struck soundings on a bank, the centre of which, with only 1½ fathoms over it, was placed by Lieut. Kolff in lat. 5° 55′ S., long. 138° 0′ E.; it may be that this is the Triton, or Providential bank.*

Kolff bank.—The *Dourga*, in 1826, passed over a small patch of hard sand with 9 fathoms over it, the depth around being 19 and 20 fathoms, mud. The position of this shoal in Lieut. Kolff's narrative is lat. 7° 0′ S., long. 136° 4′ E., but in the chart prepared by Lieut. Kolff the longitude assigned is 136° 48′ E.†

Frederick Henry island,‡ the south-westernmost part of New Guinea, is only separated from the mainland by (Princess) Marianne, or Dourga strait, which was first determined to be a channel in 1835. The island is about 90 miles long E.N.E. and W.S.W., and 60 miles wide north and south. The land is everywhere low, apparently marshy and covered with a dense forest. The entire south and north-west coasts are fronted by a mud-bank extending about 8 miles from the shore with 3 fathoms on its outer edge, from which the depth increases rapidly to 9, 14, and 27 fathoms. About 50 miles north-east from cape Valsche the shoal facing the northern side of the island decreases in breadth, allowing of a nearer approach to the shore.

Dourga strait.—The northern entrance of Dourga or Marianne strait is 10 miles wide with from 8 to 11 fathoms depth of water; the width as well as the depth gradually decreases until at about 10 miles of the southern end the strait becomes narrow, carrying from 8 to 2½ fathoms to the exit. The southern entrance is less than

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* *Moluksche Archipel.*, p. 252.

† Voyage through the Moluccan archipelago and to New Guinea by Lieut. Kolff, translated by G. W. Earl, p. 319.

‡ *See* Admiralty chart, Western approaches to Torres straits, No. 447; scale, m = 0·07 of an inch,

2 miles wide, and is faced by a bar over which there is 2 fathoms of water. No danger was encountered by the Dutch ships in beating through the strait.

Water.—There is a creek about 5 miles within the northern entrance, in which the water is fresh at three-quarter ebb ; but a vessel would find it difficult to water there.

Tides.—During the passage of the schooners through the strait, 26th April to 9th May 1835, two flood streams and two ebb streams in 24 hours were observed at the entrance, but within the strait there were one flood and one ebb stream. The former set to the south, and the latter to the north at the rate of 2 to 4½ miles an hour. Rise and fall 12 to 16 feet ; time of high-water not stated.

Cape Valsche or False cape, the western extreme of Frederick Henry island is, according to Lieut. Kolff, in lat. 8° 22′ S., long. 137° 40′ E. The mud-bank which faces the coast here extends 10 miles to the westward. In 1887 captain Green of the steamer *Guthrie* announced that he sounded in 3 fathoms, soft mud, about 12 miles S.W. by W. from cape Valsche, and in 5 fathoms 9 miles further westward ; much discoloured water was seen still further to the west Caution is therefore necessary when in this neighbourhood.*

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* This depth of 3 fathoms is 3½ miles farther to seaward than is shown in the Admiralty charts, but as the locality has never been surveyed, and the astronomical position of cape Valsche is extremely doubtful, the bank may not extend to such a distance from the land. Mariners should give this point a good berth.

CHAPTER XIV.

ARAFURA SEA, AND APPROACHES TO PORT DARWIN.*

Variation 2° 30′ East in 1890.

This chapter treats of the Arafura sea, and of that part of the north coast of Australia which is included between De Courcy head to the east, and Anson bay to the west. The approaches to Torres strait will be found in the Australia Directory, Vol. III.

The ARAFURA or TIMOR SEA, that part of the Indian ocean extending from Torres strait to the island of Timor, is bounded to the southward by the northern coast of Australia, and to the northward by part of the south-west coast of New Guinea and the chain of islands lying between it and Timor.

Soundings.—The greater part of this sea has a depth of less than 100 fathoms. In proceeding westward from Torres strait the soundings increase regularly from 9 fathoms near Booby island, to about 30 fathoms between cape Valsche in New Guinea, and cape Wessel in Australia; thence the soundings increase in depth more rapidly to 100 fathoms midway between the Arru islands and cape Croker, and to 645 fathoms 15 miles south of Timor Laut. A lesser depth of water, however, continues along the north and north-west coasts of Australia, and the 100-fathom line can be traced from the above point midway between the Arru islands and Croker westward as far as the Sahul bank, 50 miles south of Timor, and then south-west gradually approaching the Australian coast.

The depths over this Australian bank are mostly between 40 and 60 fathoms, and to the eastward of the meridian of Dundas strait are fairly regular; to the westward of that line they are irregular from 20 to 70 fathoms with patches of less than 20 fathoms, and are especially irregular near the edge of the bank, where various shoals have been found. Other shoals probably exist, and a good look-out should therefore be kept in navigating these waters.

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* Compiled by Captain J. P. Maclear R.N., mainly from his surveys and remarks, 1889, and supercedes the account in Australia Directory, Vol. III. of 1881.

SHOALS.—The **Sahul bank** is out of the scope of this work; a description of it will be found in the Australia Directory, Vol. III.

Troubadour shoal, in lat. 9° 44′ S., long. 128° 30′ E., has a depth of 9 fathoms, and at about S.E., 13 miles from it H.M.S. *Fly* discovered a shoal with 12 fathoms, sand and reddish coral.

Flinders bank, with from 11 to 15 fathoms on it, was discovered by H.M.S. *Fly* in lat. 9° 57′ S., long. 129° 35′ E.; it is probably connected with the 7-fathoms bank, seen by Captain Flinders, at about 9 miles farther to the westward.

Lynedoch bank is a coral shoal, about a mile in extent, with 7 fathoms water on it, in lat. 9° 54′ S., long. 130° 40′ E.

Victoria shoal, which has only 4½ feet water on it, is supposed to lie in about lat. 9° 13′ S., long. 131° 24′ E., but its position is doubtful.

Indus reef.—This reef, reported by the commander of the steam vessel *Indus* in 1884, is stated to be about one mile in extent in a north-east and south-west direction, and a quarter of a mile wide, and to have very little water on its south-west end.

Money shoal, about 5 miles in extent, with 4½ fathoms water on it, lies in lat. 10° 19′ S., long. 132° 47′ E., and about N. by E. 43 miles from cape Croker.

The Winds and Weather in the Arafura sea have already been described in Chapter I.

TIDES.—The set of the tidal streams in the Arafura Sea is not well known, but the streams do not appear to be strong, the current generally setting with the wind. The flood stream enters the sea from the eastward through Torres strait, and from the north-west by the Arru islands—(*see* page 442). Observations are wanting as to the tides between Timor Laut and Timor; but south of Timor the flood stream sets towards the east. On the north coast of Australia the flood stream sets to the eastward between cape Croker and cape Wessel, but in the offing of port Essington and Popham bay it sets to the westward, the flood entering Van Diemen gulf from the northward through Dundas strait, and from the westward through Clarence strait.

NORTH COAST of AUSTRALIA.—Only that part of the coast included in the approaches to port Darwin are treated of in this work; the coast to the eastward of De Courcy head is described in Australia Directory, Vol. III.

De Courcy head*.—From Brogden point a rocky coast trends nearly N.N.W. 14 miles to De Courcy head, which is a cliffy projection, 117 feet high, whence the rocky shore trends west 3 miles to cape Cockburn, a low rocky point, with a conspicuous tree at its extremity. The cape is wooded to within a short distance of the sea, as is generally the case on this coast.

Mountnorris bay extends from cape Cockburn N.W. ½ N. 28 miles to cape Croker, and is about 16 miles in depth. Immediately within cape Cockburn is Malay bay, which is 3¼ miles across to Annesly point, which has a reef for three-quarters of a mile off it, and 4 miles deep; it affords good anchorage in 3 to 5 fathoms.

From Malay bay the south-east shore of Mountnorris bay trends S.W. by S. 13 miles to the bight of the bay. The shore is chiefly formed by sandy beaches, broken by rocky points, but may be approached to about a mile in 4 to 6 fathoms. Thickly-wooded hills from 146 to 292 feet in height skirt this side of the bay at about a mile back.

From the bight of the bay, the south-western side trends N.W. 11 miles to the eastern entrance of Bowen strait, with extensive shoals for 4 miles off it, well out into the bay. A continuation of the hills on the eastern side follow round this side.

The northern portion of the western shore of Mountnorris bay is formed by the east side of Croker island.

Buffaloes are plentiful on the low sandy shore in the bight of the bay.

Valentia isle, 160 feet high, S.W. by W. 5 miles from cape Cockburn, lies S.W. of the entrance of Malay bay; it is 2 miles long, and thickly wooded, with reefs extending about a mile from its south-east and north-west ends. There is no safe channel between Valentia isle and the south-west point of Malay bay.

Copeland islet, 125 feet high, in the bight of Mountnorris bay, is small, wedge-shaped, and surrounded by a coral reef for the distance of half a mile, with 7 fathoms water on the northern side, and 4 to 5 fathoms on the remaining sides; on its north side is a perpendicular cliff of a bright yellow colour, which is a conspicuous object to vessels entering the bay. A covered sand-bank lies N.W.

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* *See* Admiralty charts:—Eastern Archipelago, Eastern portion, No. 942*b*, scale, $d = 2{\cdot}75$ inches; Australia, general chart, Northern portion, No. 2,759*a*, scale, $d = 1$ inch; Australia, North coast, sheet 4, Carpentaria gulf to cape Ford, No. 1,044, scale, $m = 0{\cdot}66$ of an inch; Australia, North coast, cape Stewart to port Essington, No. 1,042, scale, $m = 0{\cdot}21$ of an inch; and Captain King's Australia, Vol. I., p. 248.

by N. 3 miles from Copeland islet, which is connected by shoal water with the mainland 4 miles to the westward of it.

Copeland islet is used by the Malays during the trepang season for boiling and drying out their fish, and appears to be an important station.

BOWEN STRAIT separates Croker island from the mainland; this strait is about 20 miles long, one to 4 miles broad, and carries from 3¼ to 7 fathoms water, but is very encumbered with shoals.

DIRECTIONS.—The centre of Valentia isle, on the east side of Mountnorris bay, kept on an E. by N. bearing astern will lead to the eastern entrance of Bowen strait; the channel is broad and apparently safe for vessels drawing 15 feet water. There is said to be 4½ fathoms least water N.E. of the shoals in the middle of Bowen strait.

Darch isle is about 2 miles long E.N.E. and W.S.W., thickly wooded, and surrounded by a reef, which projects one mile from One Tree point on its north-east side. There is a narrow channel, with from 5 to 11 fathoms water, between the island and the southern bay on the east side of Croker island.

Templer and Cowlard islets.—The former, which is 57 feet high, lies about midway between Valentia and Darch isles; it is small and surrounded by a reef, especially on its north, west, and south sides, extending about a mile to the northward from the island. Cowlard islet is much smaller than Templer islet, and lies midway between it and the entrance of Malay bay.

New Year isle is the north-easternmost of a number of small islands lying off Mountnorris bay; it is a mile in extent, low and wooded, and surrounded by a reef.

Bramble rocks, on which H.M.S. *Bramble* struck in 1843, lie West 14 miles from New Year isle, and E.N.E. 13 miles from cape Croker, with 12 feet water on them.

OXLEY ISLE, W.S.W. 12 miles from New Year isle, is 2 miles long north and south, and connected by rocks with a small low and wooded islet three-quarters of a mile to the southward of it; a rocky shoal extends about a mile to the northward and to the eastward. Between New Year and Oxley isles Captain King passed over two coral banks, separated from each other by a deep channel; it is presumed that the eastern bank, on which were 9 fathoms, was the shoal extending to the northward from Oxley isle, and that the western bank, which over-falls between 5 and 7 fathoms, was the south-eastern tail of the Bramble rocks. In all the space for 5 to 8 miles East and N.E. of Oxley isle the soundings are irregular with from 5 to 9 fathoms, coral bottom.

McCleur isle, S. by W. 9 miles from New Year isle, is of triangular shape with the apex to the north-west, 2½ miles in length, and 1½ miles N.E. and S.W. at its base; a reef with a wooded islet on it projects 1½ miles N. by W. ½ W. from its north-west point, and extends round its north and south-east sides for a mile off; a 2-fathoms shoal lies at one mile from the south-west side of the island.

GRANT ISLE, 6 miles to the south-westward of McCleur isle, and 10 miles north of De Courcy head, is considerably larger and somewhat higher than either of the other islands of this group, which are merely low-wooded islets.

Grant isle is 140 feet high, 4 miles long east and west, and 1½ miles broad, with rocks off its western end and northern side, and a wooded islet on the reef off its north-east point, a dead coral reef extending for a mile off its eastern end and filling the bay on the southern side of the islet.

Lawson isle, in the space between Oxley, McCleur, and Grant isles, is of triangular form, and about 3 miles in circumference. A reef extends half a mile from its western side, and then for 2½ miles in an easterly direction, the eastern end being 1¾ miles E.N.E. of the east point of the island with two wooded islets between.

A low and wooded islet lies at 2 miles S.S.E. from Lawson isle.

Between this islet and Grant isle there are shoal patches of 4 and 4½ fathoms separated by depths of 7 and 9 fathoms.

Caution.—As the space between New Year isle and Mountnorris bay is only partially surveyed or sounded, passing vessels should keep well outside that island and cape Croker, to clear the Bramble rocks and the reef running out from the cape, and also to avoid any undiscovered dangers which may lie between the islands.

Money shoal.—Whilst avoiding the outlying dangers just enumerated off Mountnorris bay, a look-out should be kept for Money shoal, which lies about N. by E. 43 miles from cape Croker, and has 4½ fathoms water on it. *See* page 487.

Croker island.—This island is 23 miles long north and south, and from 2 to 6 miles broad. Cape Croker, the north extreme of the island, is a wooded point 79 feet high, a remarkable rocky knoll or hummock at three-quarters of a mile to the southward of it.

The northern end of Croker island forms a bay extending S.W. by W. ½ W. 9 miles from the cape to a low point, from which a reef, with an islet on it, projects 2 miles to the north-westward. From this point the coast, fronted by reefs, trends S.S.E. ½ E. 5 miles to another projection, forming the northern point of Palm bay.

Palm bay is 3 miles wide and nearly 3 miles deep, affording in the south-east monsoon, good anchorage in 4 and 5 fathoms. The shore is rocky for a mile off, and the two points between which the bay lies have rocky spits.

From the southern point of Palm bay the west side of Croker island appears to be stony and mostly covered with scrub.

The southern half of Croker island is wooded, and at its south-east point at 4½ miles from the southern extremity, the land rises to the height of 192 feet.

There are two bays between 8 and 14 miles from the south point of the island, each being nearly 3 miles across; Darch isle fronts the southern, which has a sunken rock in the middle of it; the northern bay has the most water in it, having from 3½ to 6¾ fathoms, a rock which dries 3 feet lies on the southern side of the entrance. There is an average depth of 5 fathoms at a mile from the east coast of the island, between its north and south-east points.

Britomart shoal.—Some sunken rocks, on which H.M.S. *Britomart* struck, lie N.W. 4 miles from cape Croker, with apparently shoal water extending about 3 or 4 miles to the north-westward of them. There is a channel, not properly sounded, between the rocks and the cape.

Tides.—It is high water, full and change, in Mountnorris bay, at 6h.; springs rise 6 feet.

Raffles bay, about 6 miles to the south-westward of Palm bay, is an inlet penetrating 5 miles into that portion of the mainland named Cobourg peninsula. It is 2 miles broad at the entrance, the western head is D'Urville point, and the eastern head High point, which also forms the southern point of the north-west entrance of Bowen strait. High point and the opposite shore being fronted by rocks, the entrance of Raffles bay in 3 to 4 fathoms is contracted to little more than one mile in breadth.

The shores of Raffles bay are low and thickly covered with mangroves, but at the head is a cliff where Captain King saw two streams of fresh water, which appeared only temporary. The depth of water does not exceed 3½ fathoms, but the bay affords safe anchorage for vessels of suitable draught, sheltered from all winds. The British Government established a settlement on the eastern side of Raffles bay in 1827, which was abandoned in 1829.

Campbell reef, three-quarters of a mile in length, is 2 miles to the northward of D'Urville point, and 2 miles off the shore between that point and Danger point. The reef is in the way of vessels working along the western shore, if bound to Raffles bay or into Bowen strait.

Port Bremer.—From the entrance of Raffles bay the coast trends N.N.W. 5 miles to Danger point, a low point on the east side of port Bremer. A small sandy islet, No. 2, with a reef extending half a mile from its north end, lies 2 miles to the north-westward of the point, from which it is separated by a narrow, and apparently, 4-fathoms channel. The bay forming the entrance of port Bremer is 7 miles across from the point just mentioned, to a projection of the mainland, with a small sandy islet, No. 1, off it, 2½ miles to the eastward of Smith point. The islet, which had a solitary tree on its centre, is connected with the coast, by a ledge of rocks extending off the shore for one mile to the northward. The shores of the bay are bordered with rocks and shoals, extending nearly 2 miles from the land. The port, which is the inlet at the head of the bay, is similar in extent and capabilities to Raffles bay, affording good anchorage, in from 4 to 6 fathoms, sheltered from all but north winds.*

Smith point, nearly W.S.W. 28 miles from cape Croker, is low, and rocky, the round tower on its extremity, built to distinguish this from the other low points projecting from the north side of the Cobourg peninsula, is now in ruins, and cannot be distinguished by a vessel until she is inside the point.

A reef extends N.N.W. three-quarters of a mile from Smith point, some of the rocks on its outer extreme being above water.

Anchorage.—During the south-east monsoon good anchorage may be obtained between Smith and Black points, east side of entrance to port Essington.

The natives will point out where fresh water may be found in the vicinity of this anchorage.

PORT ESSINGTON is an extensive inlet, penetrating from the north, to nearly the opposite side of Cobourg peninsula, about S.S.E. 19 miles; the entrance is 7 miles wide from Smith point W. ¼ S. to the eastern projection of Vashon head. The land being very low on either side, port Essington is difficult to make, and somewhat dangerous on account of the Orontes reef, which lies off the entrance of the port.

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* *See* Admiralty chart, Melville island with Dundas and Clarence strait, No. 613; scale, $m = 0·13$ of an inch; and Admiralty plan of port Essington, No. 1,333; scale, $m = 1$ inch.

The settlement of Victoria was established in 1838, and occupied until 1849 by a detachment of Royal Marines. Port Essington was probably abandoned in some measure in consequence of the unhealthy nature of the climate and the unproductive character of the country.*

Vashon head is a low-wooded point, with a rocky spit enclosed by shoal water, extending 2½ miles to the northward; within the head the land is low, swampy, and partly covered with mangroves, and a few casuarina, visible at a distance of 9 miles from a height of 18 feet. The western shore of the point turns sharp to the southward into Trepang bay, and is fringed by a reef half a mile to one mile wide.

Orontes reef, on which a merchant vessel of that name was wrecked, lies off the entrance of port Essington, nearly equi-distant from Smith point and Vashon head; it is about a mile long south-east and north-west, and three-quarters of a mile broad. From the most shallow part of the reef, which has only 2 feet water on it, Smith point bears S.E. ½ S. 5¼ miles, and Vashon head S.W. 6¼ miles. As the sea seldom breaks on this reef, it cannot be seen even when close to it; though the water is usually discoloured.

Reef.—A reef with 12 feet over it at low water is reported as lying in lat. 11° 0′ S. and long. 132° 3′ 30″ E., with Orontes reef in line with Smith point bearing S.E. ¼ S., and Vashon head S. ½ W. distant 8 miles.

This reef was searched for by the *Flying Fish* in 1886, on both bearings given, but was not found; the natives of the locality knew nothing of it, though well acquainted with Orontes reef. It should be noted that from a position with Vashon head S. ½ W. distant 8 miles, Smith point could not be seen from the bridge, and Vashon head was indistinct.

The Eastern shore of port Essington.—From Smith point, the general direction of the east shore is S.S.E. 7½ miles to Table head, which is low and rocky with a small sunken patch at a quarter of a mile to the north-westward of it. The most projecting part of the intermediate shore is Black point, close within which is a fresh-water pool. Reef point, which has a reef extending half a mile to the south-westward is the next projection, between which and Table head is Berkeley bay. The shore is varied by several small ranges of cliffs from 20 to 30 feet high, generally of a red or white colour ; between these are shallow coves, backed by mangrove swamps ; the low country being generally wooded by low dark looking gum trees. There is a red and white stratified cliff in the north-west part of Berkeley bay, and in the bight at 1½ miles to the north-eastward of Table head, is a red cliff, forming the north-east side of the entrance of Caiman creek.

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* *Hurricane.*—In November 1839, a violent hurricane passed over the port, during which H.M.S. Pelorus, was driven ashore. *Naut. Mag.* 1840.

Record point, S. ½ W. 5 miles from Table head, is a low narrow tongue of sand, partially wooded, and extending S.W. 2 miles from the general coast line ; it is steep-to, there being from 6 to 8 fathoms at the distance of a cable's length.

A 2-fathoms shoal, with deep water round it, lies in the way of entering the Inner harbour ; about N.N.W. ½ W. rather more than half a mile from the point.

The intermediate shore forms two shoal bays, divided by Observation cliff, at three-quarters of a mile to the north-westward of which lies a shallow patch.

The Western shore of port Essington from Vashon head, trends south-eastward to Coral bay, which affords anchorage in from 3 to 4 fathoms, sheltered from easterly winds by Walford point, a narrow projection 1½ miles long, bearing S.E. ½ E. 4½ miles from the east projection of Vashon head. The intermediate shore is fronted by reefs, and shallow water extends from half a mile to 1¼ miles from the land. A reef projects north-west half a mile from Walford point and a small 6-feet patch surrounded by deep water lies somewhere about a mile to the eastward of the point, but its position is doubtful.

Turtle point, S.E. ½ E. 3 miles from Walford point, projects nearly 1½ miles from the general coast line, its extreme being fronted by rocks nearly a mile in extent south-east and north-west. On the west side of Turtle point is Kennedy bay, which is separated from a smaller bay to the north-west by Low point. From Turtle point the shore trends nearly south 3½ miles to Curlew bay, a shallow cove on the west side of Curlew point. The shore is fronted by reefs extending from about half a mile to one mile from the land.

Knocker bay is an islet between Curlew and Oyster points ; the latter is a bluff head, S.E. by S. 2¼ miles from the former, with a 2-fathoms patch lying one mile to north-eastward. Knocker bay penetrates about 3½ miles to the southward, and with the exception of Bedford head, on the west side of the bay, the shores are generally low and covered with mangroves, the southern part being divided into two bights, with creeks running into the mangrove swamps to the southward. The greater portion of the bay is occupied by reefs and shoals bordering the shores, the depth between them being from 3 to 4 fathoms, mud.

Spear point, S.E. by S. 2 miles from Oyster point, is a rocky head, forming the west side of the entrance of the Inner harbour of port Essington. The intermediate shore is fronted by shoals, extending two-thirds of a mile from the land. Although the channel between Spear and Record points, which leads into the Inner harbour, is nearly one mile wide, only the eastern side, by Record point, is navigable, as a reef extends two-thirds of the way across the channel from the western side. This contraction of the passage causes a great velocity in the tide stream, and a consequent increase in the depth of water, there being 12 fathoms on the eastern side of the channel.

The Inner harbour of port Essington is a spacious and nearly land-locked sheet of water, divided into three bays by Middle head and Mangrove point. The head is a broad cliffy projection S.S.E. 2¼ miles from Record point; it rises to a hill 200 feet high, and is fronted by rocks and shoals, with a spit extending 1¼ miles to the north-westward; its extreme, which has 6 feet water on it, bears South 1½ miles from Record point.

Barrow bay, on the eastern side of the harbour, between Record point and Middle head, is about 3 miles in extent; its shore is generally low and covered with mangroves, the country behind is more elevated and thickly wooded, Saddle hill being 250 feet high. There is a small creek nearly 3 miles to the eastward of Record point, apparently communicating with fresh water. The bay is skirted with mud-flats, and is shallow throughout, the depth gradually increasing from one fathom near the shore to 5 and 6 fathoms in the entrance.

The shores of East and West bays, the shallow inlets terminating at port Essington to the southward, are fronted by mud-flats and bordered with mangroves, intersected in the bights by creeks communicating through mangrove swamps, with brackish and, in some places, fresh water. From Mangrove point, which separates these two bays, a spit extends three-quarters of a mile to the northward.

The site of the late settlement of Victoria is a table-topped projection of the western shore of the Inner harbour, extending about half a mile north and south between Minto and Adam heads; the latter, on which was formerly a block-house, is a whitish cliff about

45 feet high, at 2¾ miles to the southward of Spear point. There is a small bight on the north side of Minto head, between which and Spear point the shore is fronted by shoals, extending to a line from Minto head to Record point. Between Adam head and West bay is Wanjewanja cove, which is nearly occupied by mud-flats.

Geographic position. — The site of the late Government house at about N.W. a quarter of a mile from Adam head, is in lat. 11° 22′ 2″ S., long. 132° 09′ 18″ E.

The SOUNDINGS throughout port Essington are generally very regular, varying between Orontes reef and Record point, from 15 to 5 fathoms; when within Record point the depth gradually decreases to 3 fathoms abreast of the late settlement. For large vessels the best anchorage in the Inner harbour is in 6 fathoms, at about three-quarters of a mile to the southward of Record point, but vessels of less draught may anchor in 3 fathoms, at a third of a mile off the late settlement, where fresh water may probably be procured at the wells formerly dug there.

ASPECT.—The country about port Essington is generally low and thickly wooded, the most elevated hill not exceeding 250 feet. Much of the land is swampy and covered with mangroves, with several creeks and lagoons containing fresh or brackish water, according to the season of the year.

The cliffs and rocks are of a varied kind of red and whitish sandstone, in some places rather soft and powdery, and in others more hard and tough, with various quantities of ironstone in its composition. The masses of ironstone in the cliffs generally form small headlands, the sand-stone having been worn away on either side. The surface of the ground, except in the swamps and lowest hollows, is composed wholly of sand and gravel of the same nature as the rock, with small ironstone pebbles, without any apparent mixture of vegetable soil.

Vegetation naturally partakes of the character of the soil, the forest or bush, consisting of small gum and other trees, and some straggling grass; but little or no other undergrowth of any kind, was to be seen over large tracts. In some places the cabbage-palm was plentiful, and near the lagoons some coarse rank grass.

DIRECTIONS.—In making port Essington, little more need be said than to warn the navigator of the dangers lying to the eastward and northward of cape Croker, and to remind him that, the land being low, he must depend solely upon his reckoning for making the entrance of the port. Having made out Smith point, a vessel may enter the port between the point and Orontes reef, and proceed up in about mid-channel or as best shown by the plan. In entering the Inner harbour, look out for the 2-fathoms shoal N.N.W. ½ W. of Record point, and pass within a quarter of a mile of the point, to avoid the shoal extending from Spear point, and, keeping clear of the spit projecting from Middle head, anchor as most convenient.

CURRENTS.—Off Vashon head, the west entrance point of port Essington, the current sets to the westward between the months of March and October, increasing in strength towards Danger point, the west entrance point of Bowen strait; the direction of the current changes with the monsoon, average rate being one knot an hour.

TIDES.—It is high water in the Inner harbour of port Essington, full and change, at 3h. 24m.; springs rise 13 feet; but the rise and fall are very irregular, the rise sometimes not exceeding 3 feet. The flood stream sets strongly to the westward past Smith point and Vashon head.

Trepang bay, immediately to the westward of Vashon head, is nearly 8 miles across S.W. by W. ½ W. from Vashon head to a low sandy point, Araru, with three large casuarina trees on it, and covered with mangroves and pandanus. A small sandy islet named Allaru lies 1½ miles to the N.W. of this point, and is surrounded by a reef that extends half a mile to the northward.

The bay is 4 miles in depth, and at the end is divided by a reef that stretches out nearly 2 miles from some conspicuous red cliffs. There is good anchorage everywhere in the bay, which shoals gradually to the head, but the coast all round has a marginal reef extending generally half a mile from the shore. There are a few huts on each side, occasionally inhabited by natives collecting trepang. The *Flying Fish* anchored in 5½ fathoms, with Red cliff at the end of the bay S. 30° E., and Araru point S. 86° W.; good holding ground of blue mud.

The tidal stream is scarcely felt in the bay.

Blue-mud bay, the next to the westward of Trepang bay, is 3½ miles wide between Araru and Lingi points, and 3 miles in depth; but, with the exception of two narrow arms, it is nearly filled up by reefs. The bay, however, affords secure anchorage for boats and small craft, and is the head-quarters of the trepang fishery. Lingi, the western point of the bay, is well wooded, the trees being about 60 feet high; the point ends in a narrow sand spit half a mile long, and it is surrounded by a reef that dries for one mile out at springs, and past which the tide sweeps at the rate of 2 knots.

POPHAM BAY.—This is the most western indentation of Coburg peninsula, is 5½ miles wide N.N.E. and S.S.W. from Lingi to cape Don, and is divided into two bays by Observation point, close off which is a bank of sand and dead coral. Bird island, a low flat islet covered with grass, lies three-quarters of a mile N.N.E. of the point. This islet was the observation spot of the *Beagle* in 1839,* that of the *Flying Fish* in 1886 being the point itself before mentioned. Over Observation point rises a very conspicuous hill, Popham hill, very steep on its northern side.

The Eastern bight of Popham bay is the larger of the two bights ; it runs nearly 3 miles inland, shoaling gradually to the head, where it merges into a mangrove swamp, which reaches across to Van Diemen gulf. In this swamp are several creeks, one of which runs right through, with just sufficient water to allow a whale-boat to be pushed through at high-water, neaps. This creek is used by the natives for their canoes, in order to avoid rounding cape Don, where there is often a dangerous tide race.

Anchorage.—There is very good anchorage in the south-east monsoon in 9 fathoms, with Lingi point N. 25° E., and Popham hill south ; care must be taken to avoid the reef off Lingi, as there are detached lumps off it.

The Western bight is small, and the soundings in it are irregular. Immediately to the southward of observation point there is a little cove, with a depth of 4 to 6 fathoms, and a white sand beach at the end ; it is much narrowed by reefs on either side. This cove, and a small lagoon farther west, are visited by natives from Blue-mud bay on their fishing expeditions.

The ground is very foul for 1½ miles north-north-east of cape Don; and at that distance from the cape there is a shoal with less than one fathom at places ; nearer the shore there are groups of rocks that show. This vicinity should be avoided especially, as the tides are very strong.

Geographical position.—Observation spot, the middle of the white coral spit dividing the two bays, lies in lat. 11° 16′ 12″ S., and long. 131° 47′ 36″ E.

Tides.—It is high water, full and change, at Bird island, Popham bay, at 5h. 42m. ; springs rise 8 feet. Within the bay the streams are not very strong, but in the offing they are very strong, especially off cape Don, where at springs they raise a dangerous race. The *Flying Fish* could hardly stem the flood tide at springs when steaming 5 knots.

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* Stokes' Discoveries in Australia, Vol. I., p. 403.

Cape Don, the south-west point of Popham bay, and the western extreme of Coburg peninsula, is a low, wooded point fronted by a reef. The land rises to a rounded hill 130 feet high a mile to the south-south-east of the cape.

DUNDAS STRAIT, the entrance into Van Diemen gulf from the northward, is 14 miles across from cape Don W.S.W. to the east extreme of Melville island. The water is generally deep, but the soundings are rather irregular, and the bottom mostly rocky. There are strong tide ripplings and the water is much discoloured in patches.

The eastern coast of Melville island has not been surveyed. Between the eastern point of the island and the Vernon islands the ground is more or less foul, and several shoals lie at some distance from the shore; these will be described presently. The shoal ground at the entrance of the bay north of Keith is said to lie nearer the cape than shown on the chart.

CAUTION.—The Harbour-master at port Darwin reports that the mail steam-vessel, running between that port and Adelaide, by way of Torres strait, grazed over a shoal in Dundas strait, the position of which is not known.

Tides.—The set and turns of the streams in Dundas strait are not well known; during springs they run with great strength. The flood stream enters Dundas strait from the northward, and after passing cape Don sets to the south-east. The ebb stream sets to the northward out of the strait. Probably the course of the tides is interfered with by the streams passing outside of Dundas strait.

VAN DIEMEN GULF is bounded to the northward by Cobourg peninsula; to the eastward and southward by the mainland, and to the westward by Melville island. The gulf extends 75 miles East and West and 45 miles across. There are two entrances, Dundas strait, already described, to the northward, and Clarence strait to the westward, between Melville island and the mainland.

The *Beatrice*, in 1864, found the soundings across the centre of Van Diemen gulf to be very irregular, varying from 20 fathoms to 5 fathoms, sand, from the latter depth, in one place mount Bedwell bore N.E. by E. ½ E., and in another place mount Roe bore the same

SHOALS on the WESTERN SIDE of the GULF.—The *Barracouta* passed over a patch having 4 fathoms on it, with cape Keith bearing S.W. by W. ¼ W., distant 5 or 6 miles.

Renard bank.—H.M.S. *Renard* in February 1875 touched on a sand-bank with 8½ feet water on it, the north end of cape Keith bearing N. 42° W., distant nearly 4 miles. The shoal was about 300 yards in diameter, and the depth, close-to, on its east side, 14 fathoms; with 7 fathoms inside the shoal.

Claude Hamilton reef.—Captain Sinclair, of the *Claude Hamilton*, reported a reef to lie with the north-east extreme of cape Keith bearing N. by E., distant about 8 miles, and a peaked hill on Melville island bearing W. ¾ N. The depth of water on the water is not stated; close to, on the eastern edge, was 7 fathoms, deepening quickly to 12 and 17 fathoms.

Taiyun shoal.—The steamship *Taiyun*, in 1880, struck on a shoal of small extent, and composed of grey sand and broken shell, having a least depth of 17 feet, with 3½ to 5½ fathoms close around, and 10 fathoms at a short distance. It was reported to be situated with cape Keith bearing N. ⅛ W., distant 14½ miles. The exact part of the slope of the hills at the back of cape Keith, which would, at a distance of 14 miles, appear as the extremity, being unknown, the position given is very doubtful, and probably the shoal is farther to the westward.*

Beagle reef.—H.M.S. *Beagle*, in July 1842, discovered a reef about 15 miles S.S.W. ½ W. from cape Keith, and 14 miles N. by E. from cape Hotham. It is 2½ miles long E.N.E. and W.S.W., and it sometimes dries.†

SHOALS on the EASTERN SIDE of the GULF.—**Beatrice reef,** 3 miles in extent north-west and south-east, lies S.S.E. ⅓ E., 15 miles from the south-west point of Greenhill island, and dries near its centre. There is also a 2 fathom patch at S.S.W., 10 miles from the same point; and other shoal patches of from 2½ to 4 fathoms.

Victoria shoal, composed of coarse grey sand about 1½ miles in extent, with 5 to 6 feet of water on it, lies about 9 miles south-west of Beatrice reef, with Mount Roe on Coburg peninsula bearing N. ¼ W.

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* A search was made in 1888 by H.M.S. *Myrmidon* over the locality reported by the *Taiyuan* without the discovery of any danger. As the bottom, however, is uneven, and the position of the *Taiyuan* was very doubtful, the shoal is retained on the Admiralty charts (P.D.) until a complete survey can be made.

† Discoveries in Australia, Vol. I. p. 404.

Tides.—The flood stream comes from the northward through Dundas strait, and from the westward between Vernon islands, and the meeting of the tides takes place somewhere about 30 miles E.N.E. of cape Hotham on the south side of Van Diemen gulf. The uncertainty, however, of this position renders the navigation of this part of the coast somewhat difficult. Captain Stokes remarks when at anchor at a position 2 miles north-east of Cape Hotham, that the tides set W. by S. and E.N.E., from half a knot to two knots; the westerly stream beginning nearly 3 hours after high water.*

North shore of Van Diemen gulf.—The coast of Van Diemen gulf has not been surveyed, and only the prominent points have been sketched in; this fact should be remembered in using the charts. From cape Don the coast trends easterly for about 4 miles, and then S.E. for some 20 miles as far as the south point of Coburg peninsula; midway in this distance there is a projecting point with a high black rock off it. The *Flying Fish* anchored south of cape Don in 17 fathoms, with cape Don bearing N. 72° W., and Black rock S. 60° E.; and again in 10 fathoms with cape Don N. 52° W., and Black rock S. 76° E.†

Mounts Bedwell and Roe are two conical hills rising respectively 5 and 3 miles N.W. of the southern point of Coburg peninsula. These two hills are the only good marks within Dundas strait for determining a ship's position; the first is 426 feet high, and the second 476 feet.

Aiton bay, to the northward of mount Bedwell, is mostly dry at low water; the bay appears to extend to the S.E. in a long inlet. Burford island, low and covered by mangroves, lies off the bay, 5 miles to the westward of mount Bedwell.

From a small bay on the east side of mount Roe the coast trends eastward 23 miles to the isthmus between Van Dieman gulf and Mountnorris bay, and is fronted by Sir George Hope island.

Sir George Hope islands are seven in number, lying from one to 8 miles from the shore. Greenhill island, the westernmost and largest of the group, extends from one to 6 miles from the foot of mount Roe. A conspicuous cliff forms the north-west part of the island, and its south-west point is encompassed by a reef. The passage between Greenhill island and the foot of mount Roe is very narrow, on account of the reefs on either side; but there is a depth of 18 fathoms in mid-channel, which leads to a port or roadstead, with from 15 to 5 fathoms, between the islands and the coast. Three small islets, with reefs, lie close to the northward and eastward of Greenhill island, and the remaining islands of the group lie near each other, from 10 to 14 miles farther to the eastward. May Day island, the largest and south-westernmost of these islands, has shoal water extending off its western side from 3 to 4 miles. There is also shoal water between May Day island and the western point of Endyalgout island on the eastern side of the gulf.

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* Discoveries in Australia, Vol. I. p. 404.

† These bearings indicate that the points are not relatively correct on the chart.

The East shore of Van Diemen gulf is very low, and broken by points and inlets, and difficult to approach on account of shallow water; it has not been closely examined; but it, including Endyalgout island, appears to take a southerly direction from the isthmus for about 33 miles to the East Alligator river, in the south-east bight of the gulf.

EAST ALLIGATOR RIVER is about 4 miles wide at the entrance, from whence it was traced 14 miles, following the windings of the stream, in a S.E. direction. A shoal which dries extends a mile from the western entrance point, and the mouth of the river is apparently much encumbered with mud-flats. The depths vary from 2½ fathoms to half a fathom for 10 miles within the entrance, after which it increases to 3 and 4 fathoms for 6 or 7 miles farther up. The low banks on either side are formed of soft mud, and so thickly covered with mangroves as to make landing impracticable, until 7 or 8 miles up the river.

At Captain King's farthest examination of this river the banks were 200 yards apart, with two hills nearly 3 miles to the eastward; one of these is of a sugar-loaf shape, visible from the mouth of the river. At about 15 miles to the south-eastward is a small range with two peaks, visible at the distance of 20 miles; with these exceptions the country is uniformly flat, in some parts covered with grass.

Birds of various kinds were abundant and alligators very numerous and large. No natives were seen, but fires in all directions proved the country to be inhabited.

TIDES.—It is high water on the bar of East Alligator river, full and change, at 8h. 15m.; rise 15 feet.

Field and Barron isles.—Field isle, which lies off the entrance of the South Alligator river, 10 miles to the westward of the East river, is low, thickly wooded, and 10 miles in circumference; it is surrounded by a rocky shoal, dry at low water, and extending nearly 2 miles to the north-westward. Barron islet, 2 miles to the southward of Field isle, is also low and surrounded by a shoal, apparently extending to the west point of the entrance of South Alligator river. There is a narrow boat channel with over-falls in it between the two islands.

SOUTH ALLIGATOR RIVER has a clear approach through Cunningham channel from the east side of Field isle, the depth of water being from 9 to 6 fathoms. The north-eastern side of the entrance of the river is low, but the opposite shore is formed by the base of mount Hooper, a small wooded range with three summits. The entrance is 4 miles wide, apparently free from any bar, and the river is navigable for at least 17 miles up, from the entrance, at which distance Captain King had 6 fathoms water; the least depth was 4 fathoms, at about 4 miles above the entrance.

South Alligator river was explored for 36 miles, following the windings of the stream, in a southerly direction, to about 4 miles from a peaked hill, bearing nearly S.S.W., and visible at the distance of 27 miles; at this position the river was 150 yards wide, the depth at *high water* being 2½ fathoms.

The banks of South Alligator river were in most parts thickly lined with mangroves, and nowhere more than 3 feet above high water. They were formed of soft mud, which rendered landing impracticable except at high water. The country on all sides is a low plain, without any other object to break its level appearance than a few wooded hills and some groups of trees, amongst which the palm tree was conspicuous. The low land, at least where the fire had not passed, was covered with a thickly matted broom grass; the soil observed being a hard stiff clay, which appeared to have been frequently inundated either by high tides, or more probably by freshes in the rainy season.

The water at 36 miles up the South Alligator river was slightly brackish, but would probably be quite fresh at half ebb. The few birds seen were chiefly cockatoos. Alligators were numerous, from which circumstance these rivers receive their names.

WEST ALLIGATOR RIVER, 6 miles to the westward of the river just described, is an opening between mount Hooper and a point of the mainland at 6 miles to the westward of Barron islet. There are some wooded ranges on the point, and a reef lies 2 miles to the north-eastward of it. The west river was not examined, but, as it bore a similar appearance to those described to the eastward, this was named West Alligator river.*

The South shore of Van Diemen gulf from the north-west entrance point of West Alligator river trends W. ½ N. 55 miles to cape Hotham, forming two bays of nearly equal extent, divided by the low broad point, point Stuart,—this being the point struck by the famous explorer of that name in 1862. The coast and country behind it, are very low, and apparently thickly wooded, and to the eastward of the point is the mouth of the river Wildman.

CAPE HOTHAM is a low wooded promontory with a sandy beach fronted by coral reefs, extending 1½ miles to the northward, and 6 miles to the eastward; and an islet surrounded by a reef, lies S.E. 6 miles from the cape. On the western side, cape Hotham is skirted by a reef, which dries at low-water springs, from half a mile to three-quarters of a mile off shore, as far as Escape cliff, 6 miles S.S.W. from the cape, and on which are the remains of a small settlement abandoned in 1867; the cliffs are of reddish earth, and 28 feet high, with a level top, and about one-third of a mile in extent; the first cliffs of a red colour, seen on the eastern shore of Adam bay, are at about 3 miles from cape Hotham. There is anchorage in 4 or 5 fathoms off a sandy bay to the northward of Escape cliff.†

ADAM BAY, into the south part of which Adelaide river flows, is 11½ miles broad from cape Hotham S.W. to Charles point, and is 6 miles deep, with 4 to 9 fathoms water in its northern part, the bottom being very irregular. The shores of the bay gradually approach each other towards the mouth of Adelaide river, and are fronted by shoals, having from 3 to 6 feet water on them, which fill the bay southward of a line drawn from Escape cliff to Charles point, and extending 5 miles from the entrance of the river. The mouth of the channel through them, leading into Adelaide river, is about 1½ cables wide with a 12-feet patch of rock on the outer side of the bar, which has 14 feet water on it. The channel is nearly 4 miles long to an inner bar with 12 feet water on it; it is from 2 to 3 cables in breadth, and has from 14 to 39 feet water in it. Northward of Escape cliff, mangroves extend to the north-east for one mile, to a clear sandy beach a quarter of a mile in extent. Southward of Escape cliff the land sweeps round in a sandy bay with mangroves towards the mouth of the river; opposite Escape cliff, a coral reef extends off for more than half a mile, which dries in places at two-thirds ebb, and is quite dry at low-water springs. There is deep water close to its outer edge. Between Escape cliff and Ayers point a mud-flat fronts the shore for half a mile in breadth. Southward of Charles point on the west side to Hart point it is entirely fronted by thick mangroves, and a mud bank running off in some places for a mile.

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* The Alligator rivers were further explored in 1885 by the South Australian Government surveyors, with a view to pastoral occupation. *See* Northern Territory Reports for 1885.

† *See* Admiralty charts:—Clarence strait, No. 1,095; scale, $m = 0·73$ of an inch and Adam bay and Adelaide river, No. 1,704; scale, $m = 3·0$ inches.

Anchorage.—There is good anchorage in 24 feet, mud, for a large ship with the north end of Escape cliff bearing east, distant 1¼ miles, and half a mile off the reef. The set of the tide is very irregular.

DIRECTIONS.—The land is too low to afford any good guiding marks, and the water is at times too muddy to admit of the shoals being seen. A vessel of considerable draught should enter the channel at the last quarter flood, which will take her to an anchorage in port Daly at the entrance of the river, where the only inconvenience will arise from a 3-knot tide stream. From thence a vessel may proceed up as most convenient. The prevailing sea and land breezes —the former from the N.W.—make the bay easy of access, either from the eastward, through Dundas strait, or the westward, through Clarence strait.

Vessels intending to enter Adelaide river should bring Charles point to bear S.W. ½ W., and steer towards it on that bearing, until Ayers point bears S.E. ¾ S., when the outer buoy (black) will be seen bearing S.E. about half a mile distant. When Ayers point is brought on the above bearing, steer towards it, passing about half a cable west of the buoy, until Glyde point (the west extreme of land) is nearly shut in with the mangroves of Charles point bearing W. by N. ¼ N., when alter course to S. by E. ½ E. for the inner end of the tall straight mangroves forming Hart point, passing to the westward of the middle bank buoy (black) at about 2 cables. When the tuft of high trees at Ayers point bears E. ½ S. steer E. by S. passing about 2 cables south of Ayers point, and proceed up the river or anchor in 4½ fathoms as convenient. *See* page 507.

Due allowance must be made for the tidal stream, especially when steering S. by E. ½ E. as it sets obliquely across that course. Both streams continue to run for about 1½ hours after high and low water.

TIDES.—It is high water, full and change, in Adam bay, at 6h.; springs rise 16 feet.

Ayers point, the east point of entrance to Adelaide river is a low muddy point with mangroves to the northward, and two or three clumps of tall mangroves to the south-eastward, the land behind being covered at high-water springs. The point can be approached to 100 yards in 3½ or 4 fathoms water on any bearing north of East.

Hart point, the west point of the river entrance, is nearly a mile S.S.W. from Ayers point, with tall straight mangroves for half a mile to the N.W. of it. The shore shelves off from Hart point towards Ayers point for a couple of cables, with 9 and 10 feet water on it.

Port Daly is the name given to the space included between Ayers and Hart points on the west and Andrews point to the east. In this space, which is 1¼ miles in length and one-third of a mile broad, the depths vary from 15 to 29 feet. Andrews point is low and green, with thick straight mangroves on it. The best anchorage for a vessel waiting to proceed is, with Ayers point bearing about N.W. at a little more than one cable from the north shore, in 28 feet water, sand and stones.

ADELAIDE RIVER, within its entrance, which is nearly a mile wide between Ayers and Hart points, is divided into two branches, the main stream trending to the southward, and the salt-water arm to the south-westward. The former was traced by Captain Wickham for 80 miles, following the windings of the stream ; but in a direct line S. ½ E., about 43 miles; the river varying from 80 to 250 yards in breadth, with 5 fathoms water, and being navigable for vessels of 400 and 500 tons for about 45 or 50 miles, where the water is only slightly brackish at high tide.

For 15 miles above the entrance of Adelaide river the banks were fringed with mangroves, and higher up many of the points were thickly wooded, with vast plains on either side, dotted here and there with clumps of trees. At somewhat less than 40 miles up there was a thick jungle of bamboos, which, in places where the water is always fresh, grew to the extraordinary height of 60 and 80 feet

Adelaide river, at the farthest point examined, was subject to about 3 feet change of tidal level, it being high water nearly 6 hours later than in Adam bay ; but there was no perceptible stream, and the water, which for 30 miles had been fresh and mostly muddy, was here quite clear. Small drift wood was observed in the branches of the trees, at 8 or 10 feet above the water, showing the height which the water attains at certain seasons of the year, and the probability that portions of the low land are periodically inundated. The only rocks noticed in the parts traversed by the boats, were composed of red sand-stone.

The Salt-water arm of Adelaide river, immediately south of Hart point, is two cables wide, with low banks fringed with tall mangroves; it first takes a S.W. ½ W. direction for one mile from the entrance, with a depth of 20 feet, the next reach trending to the southward for 2 miles; it then divides into two branches, one trending 6 miles to the south-eastward, and the other about the same distance to the south-westward, when each, after carrying 2 and 3 fathoms for some distance, terminated in what, at low water, was a mere ditch, overgrown with mangroves.

Adelaide river swarmed with alligators, fish was plentiful, and many of the reaches abounded with wild fowl consisting almost wholly of whistling ducks. Few natives were seen, and those were timid.

The following description of Adelaide river is taken from the remark book of H.M. surveying schooner *Beatrice*, Commander J. Hutchinson, R.N., 1864. Rounding Ayers point the river at once takes a turn to the eastward for nearly a mile, forming the inner portion of port Daly, and then runs south-east, having a width of 3 cables for two-thirds of a mile to the Narrows, where the cliffs which are low and of the same character as Escape cliff, contract the width of the river to between 1¼ and 2¼ cables for a third of a mile in length, when it widens again to upwards of half a mile. For 13 miles above the Narrows as far as Castle point, several large creeks run into the east side of the river, the country at the back of the mangrove banks being swampy, the high-water mark appearing to be level with the banks. At about 3 miles above Castle point, the river takes a sudden turn to the north-east round a point with a magnificent clump of mangrove trees on it, beyond which the trees cleared away and brought to view large grassy plains stretching away to the eastward as far as the eye could see. The river now becomes winding and the reaches very similar to each other, the width being about 300 yards, the convex sides were covered with mangroves, while the concave sides are open and showing the country beyond. Numerous small creeks, which could be traced a long distance, flow into either side. The river narrows to 150 yards, and at 32 miles from its mouth was brackish. At about 50 miles up the river becomes forked, one branch going south-east and the other south-west, the former not more than 30 yards, and the latter 60 yards wide.

At high water the banks were just level with the river; but some low grassy ranges were in sight to the eastward and south-eastward; also a bare range about 80 feet in height, and a mile in extent W.N.W. and E.S.E. to the northward; the land to the westward gradually rising to a height of 500 feet, and lightly timbered. At 53 miles up the river, the highest point reached by the *Beatrice*, the river was 60 yards wide. Commander Hutchinson proceeded for 6 miles farther up in a boat, where the river was about 100 feet wide, and the water fresh but muddy, a low grassy range coming close down to the east bank; to the south-westward the land was higher, forming a flat-topped range with deep ravines. Commander Hutchinson considers the river quite navigable for short vessels of 200 or 300 tons for 50 miles up.

DIRECTIONS.—Andrews point on the west side of the river between the salt-water arm and the Narrows, is a low point with mangroves on it. In the centre of the river, and lying N.N.W. at 2 cables from the point, are some rocks with 4 feet on them at low-water springs; and as there are only 12 feet water on either side of them, or in the deepest part of the river immediately below, a bar is formed, which is the eastern boundary of port Daly. These rocks which, except at slack water show their position by the ripplings, should be passed on their south side. South-east of Andrews point, the depths in the middle of the river are from 3 to 4 fathoms, with generally a rocky uneven bottom, and as the banks shelve off on either side, the centre of the river should be kept. This reach from the rocks to the Narrows is three-quarters of a mile long. In the Narrows, previously described, the ebb and flood run through at the rate of 5 or 6 miles an hour; in the north-west part of the Narrows the sides are steep-to, and the least depth is 18 fathoms, with a rocky bottom; the navigation of the Narrows, however, is rendered dangerous by a rock which dries 3 feet, lying about 120 yards from the west bank near the inner end. This rock which is of sand-stone and 50 yards across, shows itself by the whirl of the tide round it. The ebb fills the Narrows with eddies, and in the wake of the rock forms a counter-current more than a cable long; abreast the rock, there are 4 fathoms water on its east side, and 13 feet on its west. Vessels should keep on the east side, where the channel is more than a cable wide. The whole of the lower or northern end of the reach, which extends to about half a mile below Castle point is shoal, in it there is a rock having only 4 feet water on it, with the deepest water abreast the rock, about 12 feet, at 60 yards from the east bank; it is advisable to keep well over on the east side right through this bend, as a shoal runs off the opposite side. At about a mile south there is a rocky ledge stretching across with 6 to 8 feet water on it, and a passage in the centre of the river with 18 feet water in it. The straight reach above Castle point received the name of Rocky reach, from the uneven and rocky nature of the bottom. At half a mile above Castle point, the *Beatrice* anchored in 3 fathoms at low water; the flood stream continued to run for more than an hour after the water had begun to fall, the full flood ran up at the rate of 2½ miles an hour. In one of the winding reaches farther up the river the *Beatrice* struck on a rock at about 30 yards from the eastern bank, where a rocky bar runs across the river, having 12 feet water in the deepest part abreast of Beatrice rock, and well over on the west side. At 53 miles up the river, the farthest point reached by the *Beatrice*, there were 5 fathoms. The water was fresh, but the influence of the tides was felt. Depths of 1½ to 6 fathoms were carried for 6 miles farther up the river. *See* page 101.

ASPECT.—Between 20 and 70 miles from the mouth of Adelaide river the soil is good light-coloured mould, apparently well calculated for the growth of sugar cane, rice, coffee, and spices. Above this, commencing at a coarse, red, gritty sand-stone projection, the aspect of the country changes from that of low plains to a slightly wooded and gently undulating surface, in some places stony. This aspect continued to the farthest point reached, where the river became very narrow, and divided into two branches, one taking a southerly, and the other an easterly direction. The former was blocked up by fallen trees, and the latter was too narrow for a boat's oars to work.

CHARLES POINT, the counterpart of Escape cliff but only 12 feet high, is woody, and fronted by a reef extending nearly half a mile off, on which are two or three rocky islets, which only cover at high water.

Rocky patches, extending 2 miles off shore and lying N.N.E. to N.E. of Charles point, are distinguishable from the tide setting over the shallowest parts causing ripples. Some of the rocks are nearly awash at low-water springs.

Ayers point bearing S.E. ¾ S. clears the outer end of the rocks.

Stephens bank is a tongue of shoal water which stretches N. by E. ½ E. from Charles point for 3 miles, and then east for 2½ miles. On this bank there are two patches of 2 to 3 fathoms, the depth over the remainder of the bank being 4 to 5 fathoms.

Tides.—It is high water full and change at Charles point at 5h. 30m. Springs rise 17 feet, neaps 12½ feet; neaps range 8 feet,

Glyde point is W. by N. 2½ miles from Charles point, the coast between forming a bay about 1½ miles deep, with low mangrove shores, and the back land showing up in the distance higher than any other part of the bay. In the south-west corner of this bay a creek which is called Leader creek falls into it, with 12 feet water at its mouth, it is of the same character as the Salt-water arm.

From Glyde point the low coast takes a general west direction for 4 miles to Fright point, and then trends W.S.W. for 3½ miles to Gunn point; after which it turns sharp south to Shoal bay. The coast is bordered by a reef which dries at low water and extends 2 miles north of Gunn point. Three clumps of mangroves form 3 islets at high water between Fright and Gunn points.

CLARENCE STRAIT, the western entrance to Van Diemen gulf, is 13 miles wide between Fright point and cape Gambier, the south extremity of Melville island; but the strait is divided into three channels by the Vernon islands. Of these channels, the widest—the northern—is considerably narrowed by the reefs off Melville island, and by detached reefs in the passage. Cape Gambier is bordered by a reef, which dries to a distance of more than a mile; and shoal water and detached reefs reach to a distance of 3½ miles from the cape. There is also a shoal on which H.M.S. *Beagle* obtained 3 fathoms with the cape bearing N. by E. 5 miles, which shoal has not been sounded out, but the bottom is very uneven to the westward of N.W. Vernon island. The middle channel, Howard channel, is therefore generally preferred.

Structure of reefs in Clarence strait.—The reefs surrounding the Vernon islands, as well as those off Fright point and cape Gambier present a peculiarity of structure, a short description of which, from its importance as regards the navigation of this locality, will not be out of place here. The reefs, composed of coral and iron-sandstone, rise in terraces or raised levels, about 2 feet one above the other, each terrace or level being clearly defined by a horizontal ridge or lip of hard coralline substance which retains the water when the tide falls. The water within the pools thus formed, is about 2 feet deep, and the enclosed space is full of patches of rotten coral on a level with the surface of the water. As a result of this structure, a rise of a few feet causes a remarkably sudden alteration in the appearance of the reef; besides which change, the effect of refraction over the heated water in these shallow pools at low tide causes the reefs themselves with islands, stones, birds, &c. upon them to appear larger than they are in reality, whilst objects behind the reefs are correspondingly obliterated.

The Vernon islands are three wooded coral islands, the tops of the trees showing an almost uniform level about 40 feet above the sea; each island stands on a separate reef of coral and iron sandstone which is entirely covered at high water, but exposed at low water, the edge of the reef drying about 6 feet at low-water springs, and being steep-to. The islands have not been explored, but as eucalyptus trees can be seen above the fringing belt of mangroves it is evident that the centre of the island is dry land.

North-west Vernon.—The western extremity of this island, Ward point, is a raised bank of white sand with detached trees upon it. The reef dries out to half a mile west of the trees and then shelves gradually to 8 fathoms at a third of a mile farther out. On the eastern side of the island the reef projects 3½ miles east of the mangroves, and Knight reef lies E.N.E. of this island reef, separated from it by a channel 7 to 12 fathoms deep. As sand-banks have begun to appear on Knight reef it is probable that it will before long become an island.

East Vernon.—On the western side of this island the reef narrows to a spit, the extremity of which is 6 cables west of the mangroves. It is marked by a red buoy (*see* Buoys, p. 513). On the eastern side the reef dries to a quarter of a mile from the mangroves, and shoal water extends from the south-western point to 1½ miles, at which distance E. by S. ½ S. from that point there is a depth of 3½ fathoms. This shoal-water is generally indicated by tide ripples. On the north and south sides of the island the mangroves grow nearly to the edge of the reef.

Rooper rock, 3 miles east from the mangroves of East Vernon island, is composed of coral, about a quarter of a mile long in a N.N.E. and S.S.W. direction, and one cable broad. The least water over it is 13 feet on a pinnacle rock at the south side of the shoal, from which the north-east extreme of East Vernon bears W. by N. The general depth over the shoal is 5 to 6 fathoms, with 8 fathoms close around; it is steep-to on the south-east side. When the tidal stream is strong there is a heavy race over the spot.

South-west Vernon island.—On the west side of the island the reef dries to two-thirds of a mile from the trees. On the eastern side the reef is very wide, and extends to 1⅓ miles from the trees. It is indented by creeks and has some sand-cays on it, which cover at high water, and shift their position at spring-tides.

Five-fathom patch.—At 3 miles E. by N. ⅓ N. from the east point of South-west Vernon, and 1½ miles south of the middle of East Vernon, there is a patch covered with 5 to 10 fathoms water. It is 1¼ miles long, east and west, and one mile across, north and south.

Henry Ellis reef lies 1¼ miles N.W. by W. of the north point of South-west Vernon; it is 4 cables long east and west, and very narrow. It is nearly awash at ordinary low water, but uncovers at very low spring tides, with 5 fathoms water close around, and 9 fathoms at 6 cables S.W. by W. ½ W. of the western end. It is marked by a black buoy (*see* Buoys, p. 513) on the north-west side.

Lyne reef, a small reef which uncovers at low water, lies W.N.W. distant 1¾ miles from the western point of South-west Vernon; there are 10 fathoms water close to its western side, and 5 fathoms close to its eastern side.

Marsh shoal is 1⅓ miles long east and west, and from a quarter to half a mile wide, and covered by 1¾ to 3 fathoms water. The western end of the shoal is 3½ miles S.W. by W. from the western extremity of the trees on North-west Vernon island, and is marked by a black buoy (*see* Buoys, p. 513). Soundings are irregular from 3¾ to 8 fathoms for nearly a mile southward and eastward of the east end of the shoal, and there are 3½ fathoms for 4 cables west of the shoal.

CHANNELS.—North Channel, between cape Gambier and North-west Vernon island is, as already stated, more than half blocked on its northern side by reefs which are the more dangerous as they only show at low water. A detailed description of these reefs would be perplexing, and the mariner had best consult the chart alone. The southernmost reef, Harris reef, is steep-to, with 8 fathoms water close to.

The southern part of this channel is 2½ miles wide, but Oliver and Smith reefs, and Price knoll, lie in the middle of it, and there are no marks at high-water to clear either these or the fringe reef of North-west Vernon; moreover, the ground to the westward of this channel has not yet been examined. Wood rock, a patch with 4 fathoms water over it, lies 2¼ miles W. by S. from the western extremity of North-west Vernon, and there may be other patches undiscovered. This channel is, therefore, not recommended.

Howard channel, between east and south-west Vernon islands, is the clearest and best defined channel, and the only one used by ocean steamers; the depth is from 20 to 30 fathoms, and the reefs are steep-to,

Tides.—The tide at springs runs 4 knots in the centre of the channel; the flood-stream to the eastward, the ebb to the westward.

Buoys.—A large cheese-shaped buoy, having pyramidal open frame work surmounted by a ball, and painted red, marks the end of the spit extending to the westward from the south-west point of East Vernon island.

A buoy, similarly shaped, and painted black, is moored in 17 fathoms off the north-west extremity of Henry Ellis reef.

A conical black buoy, surmounted by a globe, is moored in about 7 fathoms near the western end of Marsh shoal, north-west of South-west Vernon island, with Fright point bearing S.E. by E. ¾ E., and the western point of North-west Vernon island N.E. by E. Large vessels should pass westward of the buoy.

South Channel, between South-west Vernon and Fright point, has no marks to clear the reefs when covered; and there are two awkward shoals, for which there are no good clearing marks, at the eastern end of the channel, which is only used by small steamers proceeding to Adelaide river.

Directions.—Vessels bound to port Darwin from the north-eastward through Dundas and Clarence straits should steer a course to pass eastward of Renard and Taiyuan shoals, and then north-westward of cape Hotham for Howard channel. Due allowance must be made for set of the tides, remembering that the flood stream enters Dundas strait from the N.E. and after passing cape Don sets S.E, towards the head of Van Dieman gulf, being joined eastward of cape Hotham by the flood stream through Clarence strait.

During the south-east monsoon the smoke from the bush fires. combined with the haze which invariably hangs over the low land, renders it very difficult to distinguish the land during the night. It is advisable, therefore, for a steam vessel at night to run her distance at full speed from cape Don, and then to anchor until daylight.

After sighting cape Hotham a course should be shaped to pass 2½ miles east of the south-east point of East Vernon island in order to avoid Rooper rock, and when this danger is passed the course should be altered to pass through Howard Channel.

When abreast of the south-east end of East Vernon the red buoy off the west spit of the island will be seen; and from this buoy, which should be left on the starboard hand, the black buoy off Henry Ellis shoal will be seen. When abreast of Henry Ellis buoy, which should be left to port, the black buoy west of Marsh bank will be seen to the westward, and a vessel may either continue her course round the Marsh buoy, leaving it on the port hand, or from Henry Ellis reef she may steer to the S.E. for port Darwin, passing on the east side of Marsh bank, being careful to avoid Lyne reef and the shoals off Gunn point. To clear these last the hill over the middle of East Vernon should be kept open of the north-west extreme of South-West Vernon.

MELVILLE ISLAND.—This island is 75 miles long from cape Keith nearly W.N.W. to cape Van Diemen, and 38 miles broad. The north coast is indented by several bays, and on the western side in Apsley strait there is a good harbour, port Cockburn. The only exploration of the island was made in 1887, when a party from port Darwin landed about 22 miles E.N.E. of cape Gambier and crossed to Brenton bay. The timber, soils, and animals were found to be the same as on the main land.*

Cape Gambier is a low mangrove point forming the south extreme of the island; it is fronted by a reef of conglomerate coral and iron stone, 1½ miles wide, which continues to the north-west for 3½ miles and then recedes in a bight about 6 miles wide, with a sandy beach to the eastward under some light coloured banks with osier bushes. In the middle of the bight is a creek marked by tall casuarina. This locality seems much frequented by the natives, and by buffaloes.

About one mile south of this creek there is again a long beach of white sand fronted by very shallow water, which dries out one mile at low water; this appeared to extend as far as Apsley strait. Off this shore there are many sand banks, probably caused by washings from Apsley strait meeting the westerly sea that washes along the coast.

To the north-east of cape Gambier the coast trends about N.E. for 35 miles to cape Keith; it has only been surveyed for a distance of 22 miles, and consists thus far, in general, of low wooded country with sandy beaches fronted by shoal water. A line of hills between 200 and 300 feet high runs parallel with the coast about 4 miles inland. The most conspicuous feature of the coast is a light-red cliff 16 miles from cape Gambier; this cliff was named Ant-cliff by Stokes.†

From cape Keith a bay extends N.N.E. 10 miles to the east point of Melville island, and is 3 miles deep. The sunken patches, before noticed, lie in front of the bay, and a hill, 320 feet high, rises behind the shore, at about 5 miles to the north-westward of the cape.

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* "Northern Territory Times," Oct. 29th, 1887.

† Discoveries in Australia. Vol. I., p. 429.

The coast, from the east point of Melville island, takes a general north-west direction for 21 miles to Jahleel point; it is a low, thickly wooded, and is in most parts fronted by rocks. At about midway cape Fleeming, the north-east extreme of the island, projects to an unexamined point. At 9 miles to the southward of the cape is a deep sandy bay, apparently affording good anchorage, and between cape Fleeming and Jahleel point are two other bays, separated by a rocky point, with a sunken patch close off it.

The north coast of Melville island from Jahleel point, first trends nearly W. by S. ½ S. 38 miles to Karslake islet, and then north-westward 23 miles to cape Van Diemen.

Brenton bay, S.W. 8 miles from Jahleel point, is 3½ miles broad and 5 miles deep, terminating in a creek or stream of fresh water; but the western shore being bordered by a rocky shoal, and the water shallow, the bay affords no good anchorage.

LETHBRIDGE BAY, 18 miles from Jahleel point, is 7 miles broad, and although open to the N.W., affords tolerably sheltered anchorage in the east monsoon; the beach is sandy, but is probably of rocky approach. In the bight of the bay is a shallow inlet or fresh-water stream, trending S.W. between two hills; and on the western shore is a range of cliffs, the upper half red and the lower white. At about 4 miles to the north-eastward of the rocky west point of the bay are two patches of rocks, on which the sea breaks.

Karslake islet is connected by a reef with a projecting point, separating two bays, with a small opening in the bight of each like those in Brenton and Lethbridge bays. The western bay is 3 miles across and 4 miles deep.

COOK REEF, N.W. 5 miles from Karslake islet, is a small sunken patch, close off the east side of a point, projecting from a higher land than usual. On the west side of this point is a bay 7 miles broad, between which and cape Van Dieman is a range of very white cliffs, about 100 feet high and 7 miles in length, which are the more remarkable from being even whiter than the usual colour of the pipe-clay cliffs to the eastward.

ASPECT.—The hills and coast are wooded to the edges of the cliffs and sandy beaches that vary the northern shores of Melville island; the most unproductive part appeared to be the narrow tongue extending to cape Van Diemen.

CAPE VAN DIEMEN and MERMAID SHOAL.—Cape Van Diemen terminates in a low sandy point, with a rocky spit, on which are some sand-banks dry at half tide, extending 3 miles to the north-westward. From this spit and the west side of the cape, as far as Piper head—a steep red and white cliffy projection, 6 miles to the southward—the Mermaid shoal extends to the westward, apparently to some strong tide ripplings, bearing W. by S. 16 miles from the cape. The northern edge of the Mermaid shoal is described by Captain King as rather steep-to, with over-falls between 10 and 4 fathoms near its edge. The western portion of the southern edge appears not to have been so closely traced; but at 5 miles to the westward of Piper head is a sand-bank, dry at low water, and between one and 2½ miles to the south-westward of the head are two patches of rocks, also dry at low water, with a covered reef close to the south-eastward of the eastern patch.*

Marie shoal.—A shoal-patch about 2½ miles in extent was passed over by the Imperial German corvette *Marie*, in October 1885, when a depth of 7½ fathoms was obtained. This shoal lies about 18 miles N.W. of cape Van Diemen, the north point of Melville island, or in lat. 10° 58′ S., long. 130° 05′ E.

The NARROWS.—The sand-bank and patches of rocks just described are situated near the south-eastern edge of the Mermaid shoal, and form the northern side of the entrance of St. Asaph bay, which is contracted to 1¼ miles in breadth by a sandy spit, dry at low water, projecting N.N.W. 2¼ miles from Brace point. A shoal extends to the westward of this spit, the limits of which have not been determined.

ST. ASAPH BAY,* which forms the northern entrance of Apsley strait, separating Melville and Bathurst islands, extends North and South 5 miles, and nearly the same distance across, from Brace point to the opposite shore. The eastern shore consists of a series of rocky points, red cliffs, and shallow bights between Piper and Luxmoore heads, which bear N. by W. and S. by E. 5¾ miles from each other. At about midway is a shallow bight, the mangrove flat behind it being apparently overflowed by the tide. The whole of the eastern shore is fronted by a rocky reef, from half a mile to one mile wide, and the land is generally low and well wooded.

St. Asaph bay is sheltered on the western side by Brace point and the sandy spit extending to the northward of it.

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* *See* Admiralty plan of St. Asaph bay and port Cockburn, No. 1,046; scale, $m = 0{\cdot}7$ of an inch.

Brace point, the north extreme of Bathurst island, is nearly isolated at high water by a mangrove swamp, extending to the westward from opening dry at low water, bearing W. ½ N. 2¼ miles from Luxmoore head.

Soundings.—The approach to St. Asaph bay, between Mermaid shoal and the shoal water extending to the westward from Brace point, has never been closely sounded, but from the west extreme of Mermaid shoal to about 5 miles to the southward of it, the soundings are from 12 to 20 fathoms, when the depth decreases to the eastward varying from 7 to 3¾ fathoms, until Brace point bears S.E. when it increases from 8 to 23 fathoms through the Narrows.

ANCHORAGE.—The depth of water in St. Asaph bay is generally regular, varying from 3 to 18 fathoms, the deeper water being on the western side; but the best anchorage is naturally on the east side, out of the influence of the tide stream.

DIRECTIONS.—Vessels entering St. Asaph bay from the westward, should proceed on the parallel of 11° 15′ S. until the north extreme of Bathurst island is seen; when the west visible extreme of the island bears South, the vessel will be nearly abreast of the west extreme of Mermaid shoal. The mark to clear the shoals on either hand is then to keep the south woody end of Piper head bearing E. ¼ N., until the water deepens to 8 and 9 fathoms. The vessel will then be near the narrows, and may steer about E.S.E. for St. Asaph bay, due allowance being made for the tide stream; and when sailing in against the ebb give a berth to the sandy spit projecting from Brace point, while it is covered, as the stream then runs over it with considerable strength.

TIDES.—It is high water, full and change, in St. Asaph bay, at 5h. 45m.; rise 14 feet. At the west entrance of the Narrows the flood sets to the eastward, and the ebb to the westward, 2 knots.

PORT COCKBURN is a portion of Apsley strait between St. Asaph bay and Harris isle, S. by E. ½ E. 6 miles from Luxmoore head. From Tamar point, the south extreme of Luxmoore head, the eastern shore of port Cockburn trends eastward 1½ miles to Lambert river, a narrow winding stream, which was traced from 3 to 4 miles to the south-eastward through low land, thickly covered with mangroves. The average depth of water for 2½ miles above the entrance, was 2 fathoms, but there is a depth of only 3 feet on the flat which bars the entrance of the river.

From Lambert river the shore, backed by a coast range of moderate elevation, trends S. by E. 3 miles to Garden point, the north extreme of King cove. From Luxmoore head to Tamar point the cliffy headland is bordered by a reef about a quarter of a mile wide, but between Tamar and Garden points the shore is fronted by a rocky shoal, the outer edge of which forms nearly a direct line from point to point. A small patch lies close to the edge of this shoal, at 2 miles to the southward of Tamar point.

King cove, situated between Garden and Barlow points, is about half a mile in extent, and appears to afford good anchorage in from 4 to 10 fathoms, mud. Fort Dundas was a small military post established on Barlow point, at the south extreme of the cove, by the British Government in 1824, but was abandoned in 1840.

The west shore of port Cockburn, from the creek abreast of Luxmoore head, trends S.S.E. ¾ E. 5 miles to interview point. It is bordered by a reef, dry at low water, with a low sandy islet near the shore, at about midway between the creek and point. A level range of wooded hills rises from the northern portion of this shore, visible at a distance of 20 miles.

Close to the southward of Interview point is Intercourse river, winding westward into a low mangrove flat, and carrying from 3 to one fathom for 3 miles up from the entrance. This stream flows into a small bay opposite King cove, so full of shoals as only to leave a narrow one-fathom channel to the entrance of the river.

The Natives about port Cockburn are numerous and hostile, several affrays having formerly taken place between them and the settlers at fort Dundas.

TIDES.—It is high water, full and change, in port Cockburn, at 5h. 45m.; greatest rise 24 feet.

APSLEY STRAIT, of which St. Asaph bay and port Cockburn form the northern portion, and which separates Melville from Bathurst island, is 1¼ miles broad, between Barlow point and the opposite shore, at Sinclair point; but close to the southward it is divided into two channels by Harris isle and its surrounding reef. Mermaid channel, on the east side, is half a mile wide, with deep water, but the passage to the westward of the island is more narrow and apparently shallow.

Apsley strait to the southward of port Cockburn, takes a general south-easterly direction from Harris isle, for 31 miles, and averages about 1½ miles in breadth, with from 10 to 13 fathoms water, but the depth near its southern entrance is very irregular, the channel being thickly studded with rocks and shoals, in many places dry at low water, the channels between them being too intricate even for a small vessel. These, together with the strong tide streams, which sometimes run 4 knots, render Apsley strait impracticable as a navigable channel.

The shore on either side of Apsley strait is generally low and thickly covered with mangroves, without any other object worthy of notice than two navigable rivers or creeks, with clear entrances, one at 1½ miles, and the other at 6 miles to the southward of Barlow point. The former was traced nearly 5 miles in a south-east direction to the base of a hill on which were some high trees. This stream is nearly half a mile wide, carrying from 8 to 5 fathoms. The latter—Bremer river—takes an E.N.E. direction for about the same distance, but it has only 3 fathoms in the entrance; within it, the depth varies from 4 to 7 fathoms for nearly 3 miles up, and then decreases from 3 to 1 fathom. Both rivers flow through low mangrove flats, covered at high water.

The country on either side of Apsley strait is generally low and thickly wooded. In the more open parts the sago and fan-palm, the pandanus, and other trees were seen, together with the gum tree, which, as usual, appeared to be the most numerous. The soil in the neighbourhood of port Cockburn has been described as very fertile; and fresh water was abundant in the month of October.

The southern entrance of Apsley strait, which is only half a mile broad, may be recognised by the remarkable flat-topped summit of one of the Buchanan islets, which lie close off the entrance, and N.W. by W. ½ W. 21 miles from cape Gambier. The coast between these islets and the cape has not been closely examined.

BATHURST ISLAND is about 30 miles in extent, the northern part being visible 21 miles, its sides forming nearly an equilateral triangle. The north-west coast from Brace point to a mangrove point at 15 miles to the south-westward, is fronted by extensive shoals, the outer limits of which have not been determined; but it is probable they extend from 3 to 4 miles from the land.

GORDON BAY is an indentation of the west coast of Bathurst island, extending from Mangrove point S.S.W. 14 miles to cape Helvetius, and is 7 miles in depth. A reef projects about 3 miles, and shoal water probably for 5 miles farther to the south-west from the point, and a small islet on a rocky spit, lies 5 miles to the southward. The south shore of the bay is formed by a sandy beach, terminating to the westward at the Twin cliffs, between which is a sandy cove where wood and probably water may be procured. Gordon bay affords good shelter in the easterly monsoon.

Port Hurd is merely a salt-water inlet at the head of Gordon bay, running up in a south-east direction for about 8 miles. The entrance, which is between two low points, is three-quarters of a mile wide, and fronted by a bar 4 miles off, with 11 feet water on it. In the entrance there are 11 and 12 fathoms, within which the port is 2¼ miles broad; it then gradually narrows to about a quarter of a mile in breadth, with a channel 4 and 5 fathoms deep. The shores are low and thickly covered with mangroves, affording no landing place. Several wooded hills face the entrance, one of which—mount Hurd—kept in the opening between the two points, is the mark for crossing the deepest part of the bar.

From cape Helvetius the coast trends southward 11 miles to cape Fourcroy, and consists of cliffs of a very dark red colour, with a remarkable projecting sand-hill at about midway between the capes. The country is thickly wooded, but very low, except where some ranges of hills rise to about 200 feet in height.*

The south coast of Bathurst island extends nearly in a direct line E. ¾ N. 40 miles from cape Fourcroy to the Buchanan islets. Near the cape are some sand-hills, but to the eastward the low coast is backed by wooded hills.

Shoals.—The British steamer *Northern* touched on a shoal with cape Fourcroy bearing N. by W., distant 3 or 4 miles; as it was very dark at the time this bearing can only be considered approximate. Heavy breakers were seen in 1886 on the 9-fathom shoal marked on the chart S.E. by E., distant 5¾ miles from cape Fourcroy.

Again, in 1886, the *Afghan* passed over a shoal—depth of water not stated—lying with cape Fourcroy N. 40° W.; a hill to the eastward of the cape N. 2° W.; and Sandy Peak hills N. 20° E.

Caution.—As other shoal ground may exist in the neighbourhood, vessels are recommended not to bring cape Fourcroy to bear westward of N. by E. while within 8 miles distance from it.

Shoal bay† is a semicircular bay of the coast of Australia, south of Clarence strait, between Gunn and Lee points. The bay is 11 miles broad, and the depth of water is 5 fathoms between the points, shoaling gradually to the shores. Hope inlet is a shallow creek at the head of Shoal bay, the eastern entrance point of which is marked by a clump of high casuarinas rising well above the low mangrove shore. On the western shore of Shoal bay there is a successful sugar plantation.

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* A rock on which the schooner *Wanguni* struck recently (1889) is reported to lie with Cape Helvetius, bearing E. by S., distant 3 miles. As the distance of this rock from the land depends upon estimation, its position is very doubtful. Originally published in "Notice to Mariners," No. 43, of 1890.

† *See* Admiralty chart, port Darwin and adjacent inlets, No. 18; scale, *m* = 0·5 of an inch.

The land at the back of Lee point rises to a height of about 100 feet, but round Shoal bay it falls, rising again towards Gunn point to the same height.

Foelsche bank is a narrow sand bank 2½ miles long N.N.E. and S.S.W., covered by 1½ to 3 fathoms water, with depths of 5 to 6 fathoms close around, excepting to the S.W. where a depth of only 4¾ fathoms continues for 2½ miles. The northern end of the bank lies 2 miles N.W. ¼ W. from the western mangroves off Gunn point, and the southern end lies 2 miles W.S.W. from the same point. There is a safe channel between the bank and the reef off Gunn point.

Clearing mark.—The hill above the middle of East Vernon island in line with the north-west point of South-west Vernon bearing N.E. by E. ½ E. clears Foelsche bank, and the shoal water westward of it.*

Tides.—It is high-water, full and change, in Shoal bay, at 6h.; springs rise 18 to 25 feet, neaps 10 to 15 feet.

Coast.—From Lee point, which is a low rocky projection with a rocky ledge off it, the flat coast trends south-west for 7 miles to East point, the eastern entrance head of port Darwin, and then turns south 3 miles to Emery point. Between Lee and East points the shore is fronted by mud flats which dry at low-water, outside of which the bottom shelves gradually. The 5-fathom line of soundings runs W.S.W. from Shoal bay, passing 2 miles north of Lee point as far as 7 miles west of that point, and then turns south almost to the coast again near East point.

PORT DARWIN† is an inlet of considerable size, and may be regarded as the common estuary of the three rivers which unite in the upper part of the harbour. It is at present and probably will continue to be the principal port in the northern part of Australia. It is here that the telegraph cable is landed, and it is the port of call for the principal lines of steam-vessels communicating with China, Singapore, and Java.

Palmerston town, on the western shore of port Darwin is the capital of the Northern territory. It is a town of growing importance, healthily situated on the table-land south-east of point Emery. The town is laid out in blocks with streets crossing at right angles; the Resident's house and the public buildings are of stone, and most of the remaining portion of the town of wood.

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* *See* view on Admiralty chart of Clarence strait, No. 1,095.

† *See* Admiralty chart of port Darwin and the adjacent inlets, No. 18; scale, $m = 0·5$ of an inch; and Admiralty plan of port Darwin, No. 925; scale, $m = 1·5$ inches; *also*, **North-west coast of Australia between the parallels of 10° S. and 21° 0′ S., No. 475; scale, $d = 2·25$ inches.**

A railway to the interior is completed as far as Pine creek, a distance of 150 miles. The railway pier is a strongly built wooden jetty, alongside of which ships of largest size can lie; but the town jetties are only roughly constructed stone piers devoid of any facilities for landing passengers or cargo.

The general appearance of the land in the neighbourhood, from Charles point on the west to Lee point on the east, is low and flat, no part near the coast rising to more than about 100 feet. It is thickly wooded, chiefly with gum trees, and bamboos and mangroves close to the waters edge. It is almost devoid of natural landmarks.

Charles point is low and flanked on its eastern side by a low reddish coloured cliff. A white beacon 40 feet high stands on the highest part of this cliff, and is situated about one mile E.S.E. of the extreme point. This beacon shows well when viewed from the same side as the sun, but when the sun is on the opposite side of it, it is difficult to distinguish. A lighthouse will shortly be erected on the point.

The coast from Charles point to West point, about 10 miles E.S.E. of it, is low and fronted by shelving rocks and much shoal water.

Charles point patches.—An extensive patch of foul ground, on which the depth varies from $3\frac{1}{4}$ to 5 fathoms, lies about $3\frac{1}{2}$ miles N.E. by E. of Charles point. The position of these shoals is generally marked by tide ripples.

West point.—The shoals which extend off West point project more than half a mile to the north-eastward of the point, and then follow the trend of the coast to the north-westward, the outer edge being at a distance of from one to $1\frac{1}{2}$ miles from the shore.

East point, which lies $3\frac{1}{2}$ miles N.E. $\frac{3}{4}$ E. from West point, is fronted by a reef, by the tail of Middle ground shoal, and by Channel rock. Between Channel rock and the shoals off West point there is a good deep channel one mile wide, forming the entrance to port Darwin.

Middle ground is an extensive bank on which the depth varies from $2\frac{1}{4}$ to 5 fathoms. The southern part of this bank lies about $1\frac{1}{2}$ miles W.SW. of East point, and is connected with it; from this position the bank extends 4 miles in a north-west direction.

Channel rock is a small rocky patch on which there are 3½ fathoms. It lies nearly 2 miles W. by S. from East point, and 1¾ miles N.E. ¾ N. from West point. This patch of rock is the outermost of the numerous shoals which extend from East point.

Clearing mark.—The extremity of Emery point in line with a peaked clump of bushes on Middle point bearing S.W. ⅓ S. leads close to the west side of Channel rock.

Land marks.—King's table and Flag hill are the only conspicuous rising grounds in the neighbourhood of port Darwin. The former is flat-topped and 190 feet high. The latter rises to a peak 150 feet high. Both are densely wooded. The peaked clump of bushes on Middle point, above mentioned, is 120 feet high and not very conspicuous.

Emery point, 3 miles south of East point, is a small cliffy promontory of white and red colour, about 20 feet high and covered with bushes. A shoal which dries in places, extends in a N.N.W. direction for 2 miles from Emery point; it is steep-to on its outer side. Fanny bay, between East and Emery points affords anchorage for small craft in 2 fathoms. On the shore of Fanny bay, above the prison there is a look-out house, from which information of vessels arriving is given. Merchant vessels are required to make their number and port of departure by commercial code.

From Emery point the coast trends W.S W. for 2 miles to Fort hill, a somewhat similar promontory but 72 feet high; here the harbour is divided into three arms.

The East arm is about 2 miles broad between Fort hill and Middle point, but the available width is reduced one half by a mud flat and shoal water off Middle point. This arm contains the principal harbour with the anchorage, the railway pier, and the landing jetty, the settlement of Palmerston being on the height above. It is sheltered from the N.W. winds by Fort hill, and has a depth of 14 to 6 fathoms. The northern part of it is occupied by a mud flat.

The survey of the harbour in 1885 extended to a distance of 4 miles from Fort hill; at this point the east arm is nearly blocked by shoals and rocks. The boats of the *Beagle* in 1839 traced the arm in a S.E. by E. direction for a further distance for 6 miles, the utmost distance at which it was found navigable for a boat.

The Middle arm, which is the most extensive of the three, is separated from the East arm by a point, Middle point, with a flat-topped hill on its extremity, and a shoal extending towards Emery point. From Middle point shoal water extends about 2 miles in a north-west direction, and is marked by a small black buoy in 1½ fathoms water, and by an iron beacon with a can top on the outer edge of the mud flat, with the hill on the point bearing S. 22° E. Vessels should not approach the beacon within 1½ cables at low water spring tides, or half a cable at high water spring tides. H.M.S. *Myrmidon's* survey in 1885 only extended as far as the flat-topped hill. The arm is 3 miles wide at this point, but 2½ miles farther south there is an islet which leaves only a narrow channel between it and a reef to south-westward of it. At 3 miles above the islet the Middle arm divides into two branches; one trends south-eastward from the islet for 8 miles, passing between groups of haycock-shaped hills, about 250 feet high, to another islet; from this point it curves to the southward for 7 miles, as far as the town of Southport, which is in communication with Palmerston by steam launch. Above Southport the channel becomes too narrow and shallow for a boat to proceed farther up. The other branch of the Middle arm was traced in a S.S.E. direction for 3 miles, and then S.S.W. for about the same distance. The depth of water in the Middle arm varies from 13 to 6 fathoms; but within the outer islet the channels are mostly occupied by shoals, until they become blocked up by masses of granite farther inland.

The West arm is a narrow winding creek running in a general southerly direction for 9 miles, its entrance being barred by a shoal which extends from Talc head to the head which separates it from Middle arm. Within the bar there is a depth of 2 fathoms for 3 or 4 miles up the channel.

The shores of all these islets are densely covered with mangroves, the adjacent wooded country being low and level, except where varied by small conical hills. Alligators are numerous in the arms of port Darwin, as also in the rivers to the eastward.

Talc head, on the western side of the entrance of port Darwin, is a small cliffy promontory, about 100 yards wide and a quarter of a mile long, the neck of land joining it to the main being not more than 20 yards across at high water. The cliffs are covered with thick bushes; the lower formation is principally granite, and the upper white and red sandstone. On the south-east side the beach is steep-to.

The west side of the harbour south of Talc head is much blocked by shoals, nearly all of which dry at low water springs.

Anchorage.—There is a very convenient berth W.S.W. of Fort hill in 10 fathoms; this anchorage is, however, exposed in north-westerly gales. The best anchorage for merchant vessels is in 6 to 10 fathoms, mud, about a quarter to half a mile south-eastward of Fort hill. The holding ground is good everywhere, but the farther a vessel is out in the stream, the stronger she will feel the tides. Ships remaining more than two days should moor with open hawse to the north-west.

CAUTION.—Great caution should be observed in taking up an anchorage near the line of the cable during the strength of the tides, as the soundings are deep, and ships sometimes drag before bringing up. This caution should be specially observed during the north-west monsoon.

The shore end of the cable, which is carried out to the north of Charles point, is very heavy, and could not be lifted by any small craft, though it might be injured, and commanders and owners of ships are subject to heavy damages if the cable is negligently fouled.

Telegraph Cable.—Position.—The shore end is landed on the mud flat below the Residence, on the east extreme of the table-land on which the town of Palmerston stands.

At about a cable's length from the edge of the flat, the telegraph cable runs W. by N. ½ N. for about 2 miles, when the north extreme of Emery point bears N.E. ¼ N., and the base of Fort hill, on which the flagstaff stands, E. by S. ¼ S.

From that position the cable lies in a N. by W. direction, running parallel to Emery point shoal for 3 miles, when the extreme of the cliff of Emery point bears S.S.E., and East point N.E. ⅓ E.

The cable then takes a W.N.W. direction for 2½ miles, when the south extreme of East point bears E. by S. ¼ S. and Talc head S. by E.

From the above position the cable is laid about N.W. ½ W. for 11 miles, when its course is changed to W. by N. ¼ N. into the offing, and in soundings beyond the depth of 14 fathoms.

With the foregoing particulars, masters of vessels can lay down the direction of the cable on their chart of the harbour.

Beacons.—Two beacons mark the position of the submarine telegraph cable. One on the edge of Jervois road, immediately under the Government residence, and the other on the mud flat westward of Fort hill. The beacons bear N.E. and S.W. from each other; and from the outer one the cable trends in a W.N.W. direction. Mariners are cautioned not to anchor close inshore until the inner beacon is open eastward of the outer one.

Jetties.—The railway jetty which projects from the foot of Stokes hill, 3 cables north-east of Fort hill, is very strongly constructed of wooden piles. The total length of the jetty is 1,120 feet, the first portion being 670 feet long from the shore and 20 feet wide, and the outer portion 450 feet long by 55 feet wide. Two vessels can berth on either side of this pier, the depth of water alongside varying from 38 feet at the outer end to 25 feet at the beginning of the inner part, at low water springs. The deck of the jetty is 6 feet above the level of high water. The jetty is fitted with mooring bollards and chains. There are boat steps at the inner end of the wide portion on the west side.*

There are two mooring buoys near Palmerston jetty:—The Eastern buoy is moored in 30 feet at low water spring tides, about one cable from the jetty head, and half a cable from the nearest part of the bank. The Western buoy is moored on the edge of the mud flat, in 2 feet at low water spring tides, and about nine-tenths of a cable from the jetty head.

The landing pier, close east of Fort hill, is roughly constructed of stone and piles, reaching across the mud from the shore to low-water mark. There are no facilities of any kind for landing cargo; boats of under 3 feet draught can float alongside; coasting schooners lie on the mud alongside and discharge. The pier is partly covered at high water, and the end of it is marked by a triangle and ball painted white.

There is another pier of similar construction on the western side of Fort hill; but the end of this pier is not marked.

Directions.—In approaching port Darwin from the eastward a course should be steered to pass west of the shoal water that extends westward of Lee and East points, care being taken not to bring Lee point to bear north of east until Emery point bears S. by E. ½ E. When the western extremity of Middle ground bears S.E. ½ S. a mid-channel course on that bearing will lead half a mile clear of Emery point. Continue this course until Fort hill bears E., in order to avoid the 3¼-fathoms patch lying one mile S.E. ½ S. from Emery point; the course may then be altered to pick up anchorage off Fort hill.

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* Northern Territory Times Almanac, 1888.

When beating into the harbour, channel island should not be shut in by Emery point.

Coming from the westward, vessels should make cape Fourcroy, the south-west point of Bathurst island, and then shape course for port Darwin, proper allowance being made for the tides which run very strong during springs :—flood stream to the eastward, ebb to the westward. In standing across from cape Fourcroy, Charles point will be sighted. Should the beacon on it not be distinguished the point may be known by its being the highest land on that part of the coast. It should not be approached nearer than 3 miles, which distance from the shore should be kept until Kings Table opens out well clear of Talc head, when a course may be steered to pass half a mile from Emery point as before described.*

Pilot.—When a vessel is signalled from the look-out in Fanny bay, the harbour master goes off to berth her. The boarding station is now fixed. Emery point bearing N. 17° W., and Talc head S. 81° W.†

Tides.—The tidal observations were taken at Fort hill and are reduced to low water, ordinary springs, or to a level 35 feet 6 inches below the top of a stone placed as a datum mark at the south-west corner of the verandah of the officers' camp quarters.

The tides are somewhat irregular, but in August their action was as follows :—

High water, full and change, 5h. 43m.

	Mean.		Max.		Min.	
	ft.	in.	ft.	in.	ft.	in.
Springs rise - - -	22	4	23	10	21	2
Neaps - - - -	15	6	17	0	14	3
„ range - - -	6	9	10	3	2	9

High and low high tides, and also high and low low tides follow each other alternately. If the high water is a high one the low water following will also be high and *vice versâ*.

At new moon in this month the tide rises higher and falls lower than at full moon, and the highest high tides follow the lower transit of the moon.

At full moon the highest high tides follow the upper transit of the moon.

Off Fort hill the flood and ebb streams run with considerable velocity, upwards of 5 knots per hour having been registered at springs, with but a very short interval of slack water. At neaps it does not exceed 2½ knots.

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* Captain H. R. Marsh, Harbour and Shipping Master, Port Darwin.

† *Ibid.*

Proceeding to the northwards in the harbour, the strength of the stream greatly diminishes ; its direction inside the harbour is always directly through the channels in which it runs.

In a position 6 miles N.W. by N. of East point the rise and fall and direction were observed at springs. The rise and fall was found to correspond with that observed simultaneously at Fort hill, but in direction the tide was circular, with no slack interval, as follows :—

					Knots.
1st	hour	after high water,	stream runs,	S.E. by E. ½ E.	0·8 to 1·8
2nd	,,	,,	variable from	N.W. by N. to E.N.E.	0·5 ,, 1·0
3rd	,,	,,	stream runs	N.N.W. ¾ W.	0·7 ,, 1·2
4th	,,	,,	,,	N.W. ½ W.	0·7 ,, 1·4
5th	,,	,,	,,	W. by N.	0·5 ,, 1·0
6th	,,	,,	,,	W. by N.	0·7 ,, 1·0
1st	,,	low water,	stream runs	S.W. ½ S.	0·7 ,, 1·5
2nd	,,	,,	,,	S. by W. ½ W.	0·8 ,, 1·2
3rd	,,	,,	,,	S.S.E. ¼ E.	0·8 ,, 1·2
4th	,,	,,	,,	S.E. ¾ S.	1·2 ,, 1·5
5th	,,	,,	,,	S.E. by E.	1·4 ,, 1·7
6th	,,	,,	,,	S.E. by E.	1·4 ,, 1·8

Supplies.—There is a coal hulk belonging to the Eastern and Australian Steam Ship Company, moored to the southward of Fort hill. The quantity of coal kept on board is uncertain. Labour is scarce and expensive, and the process of removing coal from the hulk to another ship is tedious. Under favourable circumstances 70 tons per day may be looked on as good work.

Fresh beef, bread, and vegetables may be obtained at a reasonable price. Water, but not of good quality, may be obtained from wells. The settlers depend on water collected during the rainy season.

There are at present no facilities for repairing vessels of any description.

Trade.—Port Darwin was a free port until 1881 ; Customs duties are now imposed on spirits, wine, beer, and tobacco. A Shipping-master is appointed for the shipping and discharge of seamen under the Marine Board Act of South Australia. The commanders of Australian ships are, however, required to report and clear their ships in the usual way before the Custom house officer, and a correct account in the form of entry must be given of all goods landed, although no import duties exist.

The imports in 1885, chiefly European goods, machinery and provisions, were valued at £139,261. The exports the same year amounted to £97,561, chiefly gold, tin, and copper ore, and pearl shell. During the same year 57 steam ships, of 74,617 tons, entered the port, and 20 sailing vessels, of 3,927 tons.

Weather.—A meteorological register with standard instruments is kept at the post office, Palmerston. On examination of the results for the five years ending 31st December 1885, it appears that north-westerly winds prevail from November to April, with occasional winds from south-east, especially at night. From April to September the south-east monsoon prevails, and is strongest in July ; in October it falls light, and westerly winds are frequent.

The rainy season is from November to April, the greatest amount falling in January and February. From May to September, inclusive, no rain falls. The yearly average rain fall (1872–1884) is 60·8 inches. During the south-east monsoon the weather is very hazy, and objects are frequently obscured at a distance of 3 miles. During the north-west monsoon the weather is clear.*

PORT PATTERSON is an extensive harbour 15 miles to the westward of port Darwin, from which it is separated by Charles point, a low projection of the mainland, with red cliffs, W. by S. ¼ S. 16 miles from Lee point. Charles point is fronted by rocky ledges which dry at half tide.

The entrance of port Patterson is 7 miles wide, between Charles point and Fish reef, the outermost of a chain of small sandy islands and reefs, extending N.N.E. 15 miles from the mainland, and forming the west side of the port. A reef with Middle shoal extending from it to the south-east, together, 5 miles long N.W. by N. and S.E. by S. and 2 miles broad, lies within the entrance. Between this reef and the western extreme of Charles point at 1¾ miles from the latter, is a reef with 3 feet water on it. The channel on the east side of the middle reef is one mile wide, with 6 fathoms water, and the west, and better channel, is 2½ miles wide, with from 3½ to 7 fathoms. The upper portion of the port is divided into two arms by a long narrow island, at N by W. 2½ miles from the north point of which is a small patch, dry at low water.

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* *Hurricane.*—In January 1879, a violent hurricane, known as the "Wentworth hurricane," passed over port Darwin.

Bynoe harbour.—The rocky east shore of port Patterson, forming two small bays, trends nearly south 8 miles from the west extreme of Charles point to the entrance of Bynoe harbour, the east arm of the port. This harbour winds round to the south-eastward for about 15 miles, when it branches into three deep creeks, the largest of which communicates with a chain of fresh-water holes, and the north-easternmost passes at the distance of 1½ miles from a bend of the West arm of port Darwin. The average width of Bynoe harbour is 2 miles, and the depth 9 fathoms. Close within the entrance is a hill on the eastern shore, 150 feet high, with a small bay to the southward of it, which appeared to be much occupied by shoals.

The West arm of port Patterson is about 3 miles wide, between the long narrow island and the reef and islets forming the west side of the port. It runs in nearly 7 miles to the southward and then divides into two branches, one communicating with Bynoe harbour, to the eastward, and the other trending to the southward; the former has from 9 to 3 fathoms, and the latter from 7 to 3 fathoms for about 3 miles up from their entrances.

A chain of small sandy islands upon the reef forming the west side of port Patterson, extends N.E. by N. 5 miles to Grose isle, which is 30 feet high, at one mile to the north-eastward of which is a small detached patch.

The shores of port Patterson are low and covered with mangroves, but there appeared to be some fertile land at the head of Bynoe harbour. The most elevated land near the port was about 200 feet high; but none of the detached conical hills, as noticed at port Darwin, were seen in this neighbourhood.

QUAIL ISLET, N.N.E. 4 miles from Grose isle, is situated near the northern extreme of the same reef forming the basis of the other islands, which all produce a few small trees and a little brushwood. Although Quail islet is only 35 feet high, and composed entirely of sand, a native well of excellent water was found near the centre of the islet by H.M.S. *Beagle*, in the month of September. The reef being continuous and partly dry at low water, Quail islet is frequented by the natives to procure turtle, which are very numerous at this season of the year.

A small patch lies 2 miles to the northward of Quail islet, connected with the reef by foul ground; between this and Fish reef the outermost danger, which forms the western entrance point of port Patterson, is a 2½-fathoms channel about 2 miles wide.

Reef.—A reef with several rocks above water lies W. by S. ½ S. at about 8 miles from Quail island.

DIRECTIONS.—The western entrance point of Bynoe harbour bearing S. by E. ½ E. leads through the west and best channel; but as this course also leads directly on the dangerous patch before noticed, haul over towards Quail islet when its highest hummock bears S.W. ½ W.

The best time for entering port Patterson is within three or four hours of low water, when the reefs are uncovered, as the water is generally too muddy for them to be seen when covered, and the sea seldom breaks on them.

TIDES.—It is high water at Quail islet, full and change, at 4h; rise at springs 13 to 20 feet; neaps 6 to 12 feet. The stream follows the direction of the channel, varying in velocity from one to two knots. The ebb in the offing sets W.N.W.

The COAST from the southern end of the chain of islands forming the western side of port Patterson first trends about W.S.W. 3 miles, and then forms a bay, extending S.W. by S. 16 miles to Blaze point. This coast is so low as not to be visible from a small vessel's deck at a greater distance than 6 miles, and is dangerous to approach, as the rocks and reefs which front it, extend in some parts beyond that distance from the shore. The land would appear quite barren, but for a few bushes or mangrove trees scattered about the beach.

From Blaze point, which is a low wooded point, with rocky ledges extending more than a mile off it, the coast takes nearly a south direction for 21 miles, to Channel point, the north-east extreme of Anson bay, where it attains a height of about 80 feet a short distance inland. The land is low, but more wooded than that immediately to the north-eastward.

PERON ISLES, off Channel point, are low and sandy; the north-western and larger of the two is about 7 miles long, and has a grassy peak nearly 100 feet high on its north end, bearing W.N.W. 9½ miles from Channel point; the southern portion of the island is covered with mangroves. The southern island, S.W. 2 miles from Channel point, is about 3 miles long north and south and entirely margined by mangroves. Both islands have reefs and sand-banks off their west sides, running out to a distance of 2 or 3 miles, outside which the soundings are very uneven, and bottom rocky; the reef off the north-west end of the larger island extends upwards of a mile; and it appeared doubtful whether a channel existed or not between the two islands.

The channel between the Peron isles and Channel point is intricate, there is a far better entrance into Anson bay to the southward of the islands.

Anson bay and the coast to the westward are described in Australia Directory, vol. III.

APPENDIX.

TIDES IN THE PHILIPPINE ISLANDS.

The following Remarks and Tables are taken from the Spanish "Derrotero del Archipielago Filipino 1879," but the tables should not be regarded as absolutely correct, considering the present imperfect state of knowledge on the subject of tides in general.*

During the progress of the Spanish survey of the Philippines tidal observations were made at Corregidor, Iloilo, and Balábac; these show the influence of the diurnal wave to be as great or greater than that of the semi-diurnal wave. From these observations tables for finding the time and height of high water were constructed, in which the following laws are discernible.

Two days after the moon passes the equator two flood and two ebb tides are observed during the twenty-four hours, of approximately equal value; during the next 7 or 8 days one of the flood tides increases and the other decreases, until there is only one perceptible in the 24 hours, which single tide attains its greatest value two days after the moon has reached her greatest declination either North or South.

This single tide then decreases in range as the moon's declination decreases, and soon a second tide becomes apparent, increasing daily in range and becoming equal to the first tide two days after the moon has again crossed the equator, and so forth with successive semi-lunation.

There is no regular establishment, as the luni-tidal interval varies with the days elapsed since the moon's declination was *nil*, from 2½ hours before the moon's transit to 2½ hours after. The amount of interval is given in Table I.

The range of spring tides varies with the seasons, being at a maximum about the solstices, and at a minimum about the equinoxes.

The age of spring tides varies with the seasons; at the solstices the highest tide occurs on the day of new and full moon, and at the equinoxes it occurs at the moon's quarters.

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* *See* also General Remarks Tides, p. 23, and Manila Tides p. 58; *also* **Nautical Magazine, June 1868.**

TABLE FOR FINDING THE TIME AND HEIGHT OF HIGH-WATER IN MANILA BAY, AT BALÁBAC AND ILOILO.

Table I. contains the establishment of port Corregidor, at the entrance of Manila bay, according to the number of days elapsed since the moon's declination was *nil.*

From this table the time of high water can be found by the usual method, adding or subtracting the establishment of the port accord-to the sign in the table.

TABLE I.—ESTABLISHMENT OF THE PORT AT CORREGIDOR ISLAND.*

Days elapsed since the Moon's declination was *nil.*														
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Moon's declination North.														
+ h m 10 10	+ h m 10 26	– h m 1 20	– h m 1 34	– h m 1 50	– h m 2 7	– h m 2 24	– h m 2 36	– h m 2 41	– h m 2 46	– h m 2 46	– h m 2 40	– h m 2 30	– h m 2 22	– h m 2 17
Moon's declination South.														
– h m 2 12	– h m 2 0	+ h m 11 15	+ h m 10 55	+ h m 10 35	+ h m 10 22	+ h m 10 10	+ h m 9 57	+ h m 9 48	+ h m 9 43	+ h m 9 37	+ h m 9 43	+ h m 9 48	+ h m 9 58	+ h m 10 4

For example (i.) :—To find the time of high water at Corregidor on the 1st of February 1890 ; the moon's declination was *nil* on the 25th January, therefore the number of days since elapsed is six, and the establishment of the port for the day according to Table I. is — 2h. 24m. ; then :—

	Lower.	Upper.
	h. m.	h. m.
Moon's mer. pass. at Greenwich on 1st Feb.	9 27 a.m.,	9 51 p.m.
Correction for longitude 120° E.	0 16 –	0 16 –
Correction for semi-diameter 14′ 45″ ...	0 30 +	0 32 +
Establishment of port, Table I.	2 24 –	2 24 –
Time of high water at Corregidor	7 17 a.m.	7 43 p.m.

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* The table in the " Derrotero " gives the establishment for each month ; in this work the yearly mean only is given.

Table II. contains Tidal Differences for Kavite, Balábac, and Iloilo, which being applied according to the sign + or — to the hour of high water at the standard port Corregidor, will give the hour of high water at those places.

TABLE II.—TIDAL DIFFERENCES FOR KAVITE, BALÁBAC AND ILOILO WITH REFERENCE TO STANDARD PORT CORREGIDOR.

	Days elapsed since Moon's declination was *nil.*														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Moon's declination North.															
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Kavite	−19	−15	−10	− 4	+ 2	+ 7	+11	+15	+18	+21	+23	+25	+ 26	+ 27	+28
Balábac	+27	+23	+19	+16	+15	+16	+18	+20	+23	+25	+27	+29	+ 31	+ 32	+32
Iloilo	+80	+52	+40	+33	+25	+22	+20	+24	+28	+38	+50	+74	+110	+106	+98
Moon's declination South.															
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Kavite	+28	+27	+25	+22	+18	+15	+10	+ 5	+ 1	− 4	−11	−17	− 19	− 20	−19
Balábac	+32	+32	+30	+26	+20	+13	+ 9	+ 8	+10	+12	+14	+17	+ 20	+ 24	+27
Iloilo	+90	+76	+66	+56	+48	+41	+33	+24	+20	+25	+36	+52	+ 68	+ 84	+82

For example (ii) :—If the time of high water at Corregidor is 7h. 17m. on the 6th day after the moon's declination was *nil*, the correction to be applied for Kavite from Table II. is + 11m., and the time of high water at Kavite will be 7h. 28m.

Table III. gives the height of the highest tide daily above the mean level of the sea at Corregidor ; this height should be corrected from Table IV. for the apparent semi-diameter of the moon.

For Kavite, Balábac, and Iloilo the height of high water may be found *approximately* by multiplying the height at Corregidor by 1·1 for Kavite, 1·3 for Balábac, and 1·6 for Iloilo.

TABLE III.—HEIGHT OF HIGHEST TIDE DAILY ABOVE THE MEAN LEVEL OF THE SEA AT CORREGIDOR.

MONTH.	Days elapsed since Moon's declination was *nil*.														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
January	1 0	0 9	0 6	0 9	1 0	1 3	1 6	1 9	2 0	2 0	2 0	1 9	1 6	1 6	1 3
February	1 3	1 0	0 9	0 6	0 8	0 9	1 0	1 3	1 6	1 6	1 9	1 6	1 6	1 3	1 3
March............	1 0	0 9	0 6	0 9	1 0	1 3	1 3	1 4	1 6	1 6	1 6	1 4	1 3	1 0	0 9
April	0 6	0 6	0 9	1 3	1 6	1 9	2 0	2 0	2 0	1 9	1 6	1 4	1 3	1 0	0 9
May..............	0 9	0 6	1 0	1 3	1 6	1 9	2 0	2 3	2 3	2 3	2 0	1 9	1 6	1 3	1 0
June..............	1 0	0 9	0 9	1 3	1 6	2 0	2 3	2 6	2 9	2 9	2 6	2 3	2 0	2 0	1 9
July..............	1 9	1 3	1 0	1 0	1 3	1 9	2 0	2 3	2 6	2 9	2 9	2 6	2 3	2 3	2 0
August	2 0	1 6	1 3	1 0	1 3	1 6	1 9	2 0	2 3	2 6	2 6	2 9	2 6	2 3	2 0
September	1 9	1 6	1 3	1 3	1 6	1 9	2 0	2 0	2 3	2 3	2 3	2 0	2 0	2 0	1 9
October	1 3	1 3	1 6	1 9	2 0	2 0	2 0	2 0	2 0	2 0	2 0	1 9	1 6	1 6	1 3
November........	1 0	0 9	1 3	1 6	1 9	2 0	2 3	2 3	2 3	2 3	2 0	1 9	1 6	1 3	1 0
December........	0 9	0 9	1 0	1 3	1 6	1 9	2 0	2 3	2 3	2 3	2 0	2 0	1 9	1 3	1 0

TABLE IV.—CORRECTION TO THE HEIGHT OF HIGH WATER FOR THE SEMI-DIAMETER OF THE MOON.

Moon's Semi-diameter.	Correction.	Moon's Semi-diameter.	Correction.	Moon's Semi-diameter.	Correction.	Moon's Semi-diameter.	Correction.
′ ″		′ ″		′ ″		′ ″	
14 44	– 5 in.	15 20	– 2 in.	15 56	+ 1 in.	16 32	+ 4 in.
14 56	– 4 „	15 32	– 1 „	16 8	+ 2 „	16 44	+ 5 „
15 8	– 3 „	15 44	0 „	16 20	+ 3 „		

For example (iii) :—To find the height of the highest high water above the mean level of the sea at Corregidor on the 1st of February 1890, six days having elapsed since the moon's declination was *nil*, and the moon's semi-diameter being 14′ 44″. The height of high water in Table III. is 1 foot, and the correction in Table IV. for semi-diameter is – 5 inches, therefore the rise of the highest tide on that day is 0 ft. 7 in. As the higher water of each day follows the moon's lower transit when she has North declination, the a.m. tide will be the highest. *See* example (i).

TABLES FOR FINDING THE HOUR OF HIGH AND LOW WATER, AND THE HEIGHT ABOVE THE MEAN LEVEL OF THE SEA ON THE SOUTH COAST OF MINDANAO DURING THE PERIOD FROM SPRINGS TO NEAPS.

Table I. contains the correction to "mean establishment" for Samboanga, Isabela, Palak, and Davao, which should be applied according to the sign + or −. The table is constructed for the mean parallax 57′; for every 1′ of parallax less or greater than 57′ the correction should be increased or diminished by $\frac{1}{7}$th of its value.

The "mean establishment" for Samboanga is 6h. 54m.; for Isabela 8h. 18m.; and for Palak and Davao 6h. 5m.

TABLE I.—Correction to "Mean Establishment."

Hour of Moon's transit	h 0	h 1	h 2	h 3	h 4	h 5	h 6	h 7	h 8	h 9	h 10	h 11
Correction, in minutes	m +23	m + 6	m −25	m −47	m −67	m −78	m −42	m +18	m +58	m +70	m +58	m +37

For example (i) :—To find the time of high water at Samboanga on the 1st February 1890.

	Upper. h. m.		Lower. h. m.
Moon's mer. pass. at Greenwich 31st Jan.	9 2 p.m.,	1st Feb.	9 27 a.m.
Correction for long. 122° E.	17 −		17 −
Moon's mer. pass. at Samboanga ...	8 45 p.m.		9 10 a.m.

"Mean establishment," 6h. 54m.; correction from Table I., + 1h. 6m.; corrected establishment, 8h. 0m.; then :—

	h. m.		h. m.
Moon's mer. pass. at Samboanga 31st Jan.	8 45 p.m.,	1st Feb.	9 10 a.m.
Corrected establishment	8 0		8 0
Time of high-water, 1st Feb.	4 45 a.m.		5 10 p.m.

Table II. contains the amount of reduction, according to the hour of moon's transit, to be subtracted from half mean spring range in order to obtain the height of semi-diurnal high-water for the period intermediate between springs and neaps.

The half mean spring range for Samboanga is about 2 feet; for Isabela about 1 foot; for Palak 4 feet; and for Davao 3½ feet.

TABLE II.—Reduction to the Heights of Spring Tides.

Hour of Moon's transit	h 0	h 1	h 2	h 3	h 4	h 5	h 6	h 7	h 8	h 9	h 10	h 11
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Samboanga	2	0	0	2	4	8	12	12	10	9	6	3
Isabela..........	1	0	0	1	2	4	6	6	6	5	3	2
Palak	2	0	0	4	9	16	22	25	23	18	10	5
Davao	2	0	0	3	8	14	20	22	20	16	10	5

Table III. contains a correction to the height of semi-diurnal high tides for diurnal inequality, and should be applied as follows:—for moon's declination North add to the tide following the moon's lower transit, and subtract from the tide following the upper transit; for moon's declination South, add to the tide following the moon's upper transit, and subtract from the tide following the lower transit.

The correction for parallax is inconsiderable, amounting to less than an inch as maximum.

TABLE III.—Correction to the Height of Semi-diurnal High Water for Diurnal Inequality.

Moon's declination.		0°	5°	10°	15°	20°	25°	28½°
		in.	in.	in.	in.	in.	in.	in.
Samboanga	December, January, June, July ..	0	4	7	11	14	17	20
	February, May, August, November	0	3	5	9	12	15	17
	March. April, September, October	0	2	5	8	10	12	14
Isabela....	December, January, June, July ..	0	5	10	15	20	23	27
	February, May, August, November	0	4	7	12	17	20	24
	March, April, September, October	0	3	6	11	14	17	20
Palak......	December, January, June, July ..	0	3	5	8	10	12	14
	February, May, August, November	0	2	4	6	9	11	12
	March, April, September, October	0	2	3	5	7	9	10
Davao	December, January, June, July ..	0	2	4	6	9	10	11
	February, May, August, November	0	2	3	5	7	9	10
	March, April, September, October	0	2	3	4	6	7	8

For example (ii):—To find the height of high water above the mean level of the sea at Samboanga on the 1st February 1890; the reduction from Table II. for moon's mer. pass. 7h. is — 12 inches, and the correction from Table III. for moon's declination 23° N., is + 14 inches for the tide following the moon's lower transit, and — 14 inches for the tide following the moon's upper transit; then :—

	Lower.		Upper.	
	ft.	in.	ft.	in.
Half mean spring range, Samboanga	2	0	2	0
Reduction from Table II. mer. pass. 7h. ...	1	0—	1	0—
Correction from Table III. decl. 23″ N.	1	2+	1	2—
Height of high water following moon's transit ...	2	2	0	2—

That is :—The high tide following the upper transit does not rise to the mean level by 2 inches.

Table IV. contains a correction to the time of semi-diurnal low water for diurnal inequality. In applying this correction it should be remembered that the low tide which preceeds the highest tide of the day is in advance, while that which follows it is delayed. The sign (*) in the table indicates that for the corresponding declination of the moon there is but one tide in the day.

TABLE IV.—CORRECTION TO THE TIME OF SEMI-DIURNAL LOW WATER FOR DIURNAL INEQUALITY IN MINUTES.

Moon's declination.		0°	5°	10°	15°	20°	25°	28½°
		m.	m.	m.	m.	m.	m.	m.
Samboanga	Full and change	0	10	15	20	24	26	30
	Three days after full and change..	0	11	18	25	30	41	48
	Quarters	0	32	48	*	*	*	*
Palak and Davao—Mean correction		0	4	7	10	13	16	18

For example (iii) :—To find the time of low water at Samboanga on the 1st February 1890. The highest high water of that day being at 5h. 10m. p.m. (*see* example i.) then :—

	h. m.	h. m.
Approximate times of low water ...	10 57 a.m.	11 22 p.m.
Correction from Table IV.	10 advance	10 retard
Times of low water	10 47 a.m.	11 32 p.m.

The correction to the height of semi-diurnal low water for diurnal inequality is inconsiderable.

TIDE TABLE

For the coasts of the Philippines, islands in the Sulu and Celebes seas, North-east coast of Borneo, Molucca and Gillolo passages, islands in the Banda and Arafura seas, North-west and West coasts of New Guinea, and North coast of Australia.

Place.	High water, full and change.	Rise.	
		Springs.	Neaps.
Philippines.			
	h m	feet	feet
Luzon, Port Sual ...	...	6	
„ Manila bay ...	10–40	3½–6	
„ P. Laguimanok ...	1–30	5½	
„ Ragai gulf ...	...	5½	
„ Alabat island ...	10–0	9	
Lubang, Port Tilig ...	9–30	5	
Mindoro, Paluan bay ...		5	
Panay, Iloilo	Noon	5½	
Guimarás, P. Sta. Ana ...	Noon	5½	
Sebu, P. Sebu	Noon	7	
Burias, P. Busainga ...	0–30	6	
Tikao, P. San Jacinto ...	6–30	6	
Samar, P. Palapa ...	7–0		
Surigao strait	9–30?	6½	4½
„ P. Kakub ...	6–22	7	5
Mindanao, Pujada bay ...	7–0	6	
„ Davao ...	6–5	7	4
„ Sarangani Pt.	7–0	6	...
„ Palak Hr. ...	6–5	8	4½
„ Samboanga ...	6–54	4?	
„ Dapitan bay ...	3–40?	5	
Sulu sea.			
Cuyo	11–30	6	
Kagayan Sulu	10–0?	6	
Basilan, P. Isabela ...	8–18	2	
„ Tapiantana ...	6-3	7¾	
„ Malusa bay ...	...	5	
Sulu I., Dalrymple Hr. ...	7–50	4	
„ Sulu road ...	7–38	3¾	
„ Mainbun Rd. ...	7–30	4–6	
Siassi, P. Siassi	5–34	8½	
„ Lamenusa ...	...	6	
„ South Ubian I. ...	6–15	5	
Tawi Tawi, Bongao ...	6–40	6	
„ P. Tataan ...	7–23	3¼–6½	
Sibutu I.	6–50	5	
Dokkan I.	6–0	5	
Pearl bank	6–5	5	

Place.	High water, full and change.	Rise.	
		Springs.	Neaps.
Borneo.			
	h m	feet	feet
Banguey I., Mitford Hr.	...	7	
N.E. Coast, Tigabu I. ...	11–38	6½	2
„ Labuk bay ...	9–30	8	5
„ Sandakan Hr.	Noon.	6¾	1–4
„ Tambisan I...	10–52	3½	
„ Unsang Tan.	8–0	3½	
„ Dent haven...	6–34	3½	
„ Silam ange...	6 0	6¾	5¾
Sibuko B., Frederich Hn.	6–30	12	
Celebes sea.			
Sangir I., Manganitu B.	5 0	6	
Celebes I., Manado B. ...	6 0	6–8	
„ Talisse road ...	6 45	7	5½
Molucca and Gillolo passages.			
Ternate	5 10	4	
Gebi I., Fow I.		5	
Ceram, Wahai	6 0?	3–4	
Banda and Arafura seas.			
Buru I., Kayeli B. ...	1 32	4½	
Amboina, Amboina B. ...	2 30?	8	3¾
„ Saparua I. ...	1 0	6	
„ Banda... ...	2 0?	9–10	
Ké islands, Ké Dulan ...	1 26	7	
Arru islands, Dobbo Hr. .	2 30	6	
„ South point	3 45	6	
„ Jei island...	4 20	5	3
Wetta I.. Babi island ...	1 30	8	
Ukanao I., Brisbane reef	11 0?	6	
Damma I., Kulewatti B. .		7	

Place.	High water, full and change.	Rise.		Place.	High water, full and change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
New Guinea.				*Australia.*			
	h m	feet	feet		h m	feet	feet
Waigiu, Boni Hr. ...	5 0	6		Mountnorris bay ...	6 0	6	
Dampier strait	6 0	10–12		Port Essington	3 24 ?	13	3
West coast, Segaar bay...	6 30	6	4	Popham bay	5 42	8	
„ Triton bay ...	1 8	7		East Alligator R. ...	8 15	15	
„ Utanata R. .		7–9		Adam B., Adelaide R. .	6 0	16	
„ Dourga strait		12–16		„ Charles point .	5 30	17	12½
				Melville I., St. Asaph B.	5 45	14	
				„ P. Cockburn	5 45	24	
				Shoal bay...	6 0	18-25	10–15
				Port Darwin	5 43	22¼	15½
				Port Patterson, Quail I.,	4 0	13–20	6–12

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